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PRINCIPLES OF PATHOLOGY,

AND

PRACTICE OF PHYSIC.

BY

JOHN MACKINTOSH, M. D.

LECTURER ON THE PRACTICE OF PHYSIC IN EDINBURGH,

&c. &c. &c.

FOURTH EDITION.

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1836.

TO

HENRY WARBURTON, Esq. M. P.

&c. &c. &c.

THIS WORK IS INSCRIBED,

AS AN HUMBLE TRIBUTE OF RESPECT AND GRATITUDE,

FOR THE GREAT BOON CONFERRED ON THE

MEDICAL PROFESSION

BY THE

ANATOMY BILL,

OBTAINED THROUGH HIS INDEFATIGABLE EXERTIONS;

AND FOR THE

IMPARTIALITY, TALENT, AND ASSIDUITY, WITH WHICH HE,

AS CHAIRMAN OF THE SELECT COMMITTEE OF THE HOUSE

OF COMMONS,

HAS CONDUCTED THE ARDUOUS INVESTIGATION INTO THE

STATE OF MEDICAL EDUCATION,

AND WHICH HAS EXCITED THE ADMIRATION OF

PERSONS OF ALL PARTIES,

BY

THE AUTHOR.

TO

SIR JOHN WEBB, K.C.H.

DIRECTOR-GENERAL OF THE ORDNANCE MEDICAL DEPARTMENT,

&c. &c. &c.

My Dear Sir,

In presenting you with two of the preceding editions of this Work, I can say with truth, that I was actuated solely by a desire of perpetuating a record of my esteem for your public and private worth,—and of my gratitude for the many acts of kindness received from you in the course of more than twenty-five years, during which period I have had the pleasure and honour of enjoying your friendship.

It is with no small degree of satisfaction, that I take this opportunity of again dedicating the Fourth Edition to you, in conjunction with Mr Warburton, believing that it will not be the less acceptable on that account.

I am,

My Dear Sir,

Your faithful and obliged Servant,

JOHN MACKINTOSH.

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PREFACE TO FOURTH EDITION.

THE original object of this Work, was to provide those Gentlemen, who did the Author the honour of attending his lectures, with a Text-Book, in the hope that it might be found useful to them in prosecuting their studies. For some time the sale was confined to his own pupils, and the Work was entitled "*Heads of Lectures.*" But the Author was subsequently advised to launch the result of his labours before the professional public, with the title changed to that of "*Principles of Pathology, and Practice of Physic,*"—'trusting, that with all its faults and imperfections, it would be indulgently received as an humble attempt to establish a pathological system of medicine.' *(Preface to First Edition.)*

The success of this Work has far surpassed the Author's sanguine expectations; three large editions having been disposed of in the course of six years.

In offering a Fourth Edition to the Profession, the Author, very sensible of the respect due to its members, and of the flattering manner in which the Work has been received, has taken every precaution to render it worthy of a continuance of their patronage. It is considerably enlarged,—the import of every

paragraph has been well considered, many errors have been corrected, and the size of the type, and the quality of the paper, have been materially improved. He was so well aware of the imperfections of the Work, that he courted the remarks of several friends, well qualified, by their learning, experience, and ability, to undertake such a task; he has availed himself of their written and oral criticisms, and endeavoured to turn them to the best advantage. The Author stands particularly indebted in this respect to Mr Marshall, Deputy Inspector General of Hospitals, famed for a correct acquaintance with the literary, as well as the practical part of medicine,—for being an accurate observer, an inductive reasoner, and an admirable critic. If all his suggestions have not been adopted, more particularly as to pursuing an abstract style of writing, it has not arisen from any want of respect for his opinions, but merely because the Author entertains rather different sentiments.

The Author wishes his Work to be regarded merely as a book of facts, carefully collected and examined :—he lays no claim to be considered more wise, learned, or original, than any other professional man in the enjoyment of similar advantages, and who has pursued the same patient method of investigating diseases. He has been very sparing in the introduction of hypothetical discussions, and when he has attempted to explain or establish any point by reasoning, he trusts it will be found for the most part to be strictly inductive.

Whatever feeling may exist as to the manner in which he has treated the opinions of others, the Author knows that his efforts are perfectly sincere and well intended. In teaching the principles of á profession of such unbounded importance to mankind, he has ever felt himself called upon, by the combined influence of reason and humanity, to treat professional statements, theories, and practices, in the most unreserved manner. No duty is more incumbent on a medical writer, on

whose labours the lives and happiness of thousands may depend. The Author is not aware that he has ever been guilty of indulging in any expression which he would be afraid to repeat in the presence of the persons whose opinions he has impugned; neither can he be justly accused of bestowing praise from personal friendship, nor of condemning from personal animosity. He will never be ashamed or backward to confess an error, and he will feel no reluctance to give up every opinion he has formed, however long and arduous his investigations may have been, for others which may hereafter be proved to be more correct. He has given the best proof of the candour which actuates his conduct in the article on Cholera, in which he has felt himself obliged to repudiate all the opinions he entertained, when writing the former editions.

The Author most heartily deplores the morbid sensibility and irritability which exist among medical men,—no parallel to which can be found in the history of any other liberal profession. Few medical men can bear to know that the soundness of their opinions has been questioned; they regard any such attempt as a signal of deadly personal hatred, and view it in the same light as if their moral character were maliciously assailed. On what circumstances does this frame of mind depend? The Author has always attributed it to an overweening conceit, selfishness, and pusillanimity. Some may object to these statements, however true, being put in print, because they may think them calculated to injure the dignity of the profession, and to produce bad feeling. But the Author cannot believe in the existence of real dignity and good feeling, where there is such a deplorable want of high-mindedness and moral courage:—besides which, these pages are written exclusively for the professional, and not for the public eye. It cannot be denied, that practitioners in medicine stand too low in the scale of public estimation, and that "something is

rotten in the state of Denmark." But the Author trusts soon to see an important change in the profession, the first steps towards which must be *a considerable modification of corporation privileges*, and a greater degree of care and discrimination on the part of those who teach the different branches of medicine, in exciting industry and zeal among their pupils, and inducing them, by precept and example, to regard the profession of medicine more as a science, and the blessed means of doing good, than as a corrupt jobbing trade. Much substantial good might also be effected by examinators for medical diplomas, were they to feel that their own personal honour depended, more on the high moral and professional qualifications of the gentlemen admitted into the profession, than on the amount of fees received.

The facility of granting Medical Degrees in all the Universities of Scotland, has been quite disgraceful. It would not be difficult to point out many persons who would be puzzled to conjugate a verb, or decline a noun, in any of the dead or living languages, and who could not, if their lives depended on the result, write, or even speak their mother-tongue correctly, who, nevertheless, have had the credit of writing a long and elaborate Latin essay, and have successfully gone through a hocus-pocus examination before learned Professors! This trade of granting Degrees in Physic on the part of the University of Edinburgh, attracted the attention of the members of the Royal Commission appointed by His Majesty to inquire into the state of the Universities in Scotland, who were astonished at the small increase of students, compared with the large increase of graduates during the course of twenty years, from 1806 to 1826. At page 167. of the Appendix to the General Report, the Commissioners state, "that the increase from 1806 is very great, and cannot be accounted for by an increase of Medical Students, for in 1806, the number was 764, and in 1826, only 896, that is, there was

an addition of 132 students; but this bears no kind of proportion to the *multiplication of Degrees* from 37 (in 1806,) to 118 (in 1826)." But with all due submission to the Honourable Commissioners, the result can be easily explained. The first principles of *natural* philosophy, which slumbered in other places, advanced rapidly in the University of Edinburgh after the year 1806;—a strong desire had prevailed to discover the philosopher's stone—this, it is well known, failed, but the Edinburgh Professors soon arrived at that supreme degree of mental perfection, to find out the value of the precious metals, which they afterwards manufactured in a wholesale manner, by converting pieces of parchment into gold. It was not every Professor that was considered sufficiently skilled in philosophy, to entitle him to participate in the handsome pecuniary dividend—no! no! Here again there was a monopoly confined to six Professors, who would not permit the others to share the spoil. But as this transaction may not be credited, the Author will quote another passage from the same Report. "It does appear quite unreasonable, that when there are belonging to the University a number of Professors, who must be supposed equally skilled in Medical Science, there should be a monopoly of examinations to a particular part of them, *apparently for no other purpose than that the persons so favoured may receive the addition to their emoluments arising from the fees paid to the examiners.*" (Page 167.)

There is likewise a curious circumstance in the history of the Scotch Universities. It is well known, that of these, St Andrew's and Aberdeen had been in the habit of granting Medical Degrees upon certificates from qualified persons in the Profession, without the personal appearance of the candidate, and consequently without the safeguard to the public of an examination. This was done for ages, and no public remonstrance was made from any quarter. The University of Edinburgh went on with her monopoly and dis-

reputable practices, and she quietly allowed the sister institutions to do as they pleased. But in the year 1833, the University of St Andrew's, (simultaneously with the Universities of Oxford and Cambridge,) remodelled her laws, reduced the graduation fees to the same standard as Edinburgh, improved the course of study, and *appointed competent examiners*, which satisfied the public that none but well qualified persons could obtain a degree at that University. But it did not satisfy the Professors of the University of Edinburgh, that it would not destroy their monopoly, and rob them of their "loaves and fishes." It cannot be too extensively known, that the University of Edinburgh allowed a system, injurious to the public, and derogatory to medical science, to continue for ages without uttering one word of complaint; yet no sooner was an excellent system established, a system avowedly better than her own, than she commenced a war of agitation, by which she intended to shake the very walls of Windsor Castle, if His Majesty would not put an extinguisher upon the St Andrew's Examiners. Memorials were drawn up, petitions were presented, the highest law authorities were retained; other Universities and Colleges were enlisted in the unholy cause; by an intrigue, the College of Surgeons of Edinburgh was induced to join hands in the crusade, and petitioned the King in Council to *do an illegal act*. But the triumph of justice has been complete. Many persons of considerable eminence, and of high moral worth, repaired to St Andrew's in the mean time, and having undergone strict examinations, received their Degrees. The result has been, that a plan nearly similar to that of St Andrew's has, it is believed, been adopted in London by the King and Council, who by charter established a Central Board of Examiners, to grant Medical Degrees to all candidates who may be found well qualified, whether they have acquired their medical edu-

cation within or without the walls of a University, that is, under Professors or Lecturers.

Thus, aided by accidental circumstances, has the Author, by devising and planning the improvements adopted by the University of St Andrew's, succeeded in destroying the most odious monopoly that ever disgraced British legislation. The Author feels that he is justified in applying the term "*odious monopoly*" to any system that retards the progress of that science upon which the health and happiness of every one depends.

The Author trusts to the wisdom of Parliament for the speedy enactment of more liberal and equable laws respecting Medical Education; the adoption of a uniform system for all the Schools; and a more rational mode of granting degrees in Universities. It is to be hoped that the New Institutions, which must, as a matter of course, follow the recently chartered establishment in London for the granting of Degrees, will be formed upon similar principles.

EDINBURGH, 31. ALBANY STREET,
1*st January* 1836.

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PART I.

GENERAL HISTORY OF INFLAMMATION AND FEVERS.—
WITH THE PATHOLOGY AND TREATMENT OF
INDIVIDUAL FEVERS.

CHAP. I.

ON INFLAMMATION.

HISTORY OF THE GENERAL DOCTRINES, CAUSES, PHENOMENA, AND EFFECTS OF INFLAMMATION.

In the history of Medical Science, we find no subject has attracted more attention than that of inflammation; the minds of the most distinguished pathologists having been turned to the investigation with an ardour which has never been surpassed. This is to be attributed to the importance of the subject,—to the frequent occurrence of inflammation,—and to the wide range of diseases which owe their origin to this morbid action. According to many authors, inflammation and fever are thought to be mere modifications of the same pathological state of the system, while others speak of them even as synonymous terms; hence, a successful elucidation of the former, was expected to prove a triumph over the difficulties of the latter.

This interesting subject still continues to command the attention of every new inquirer,—doubtless owing to the mystery in which he finds it involved; for it must be confessed, that notwithstanding the indefatigable labours of John Hunter and others, it does not appear that any very strong light has been thrown on the true pathology of inflammation; while it could easily be proved that much obscurity has been produced, by confounding cause and effect, and by regarding some of the phenomena as principal parts of the essence of inflammation. A great mistake has also been committed, by medical in-

quirers following out an erroneous method of investigating diseases, forming false analogies, and attributing to inflammation of internal organs, all the phenomena and characters of those situated on the surface of the body,—thus drawing too largely from surgical pathology. But it may be stated, that the most deadly inflammation of important organs may proceed to a fatal termination, some with few, others with none of the symptoms hitherto universally attributed to inflammation.

In giving a history of the doctrines which have prevailed, it would be a waste of time to quote the opinions maintained previous to the time of Boerhaave, because they were inconsistent with the knowledge we now possess of the circulation of the blood. Boerhaave insisted that inflammation is produced by an obstruction to the free circulation in the capillary vessels. Obstruction, he conceived, might be occasioned by too profuse a flow of any of the excretions, and by heat, or the application of any other cause which dissipated the thinner parts of the blood, thereby producing viscidity. When this thickened state of the blood did not exist before the production of inflammation, he imagined that the larger globules of the blood found their way by some accident into the capillaries, and produced obstruction. But when the perspiration, the flow of urine, or any of the other excretions were suppressed, then he supposed the capillaries became so much distended, as to allow the thicker parts of the blood to enter, creating a more permanent obstruction; and this state he termed an *error loci*. Thus, it will be seen that Boerhaave had two causes of inflammation,—viscidity of the blood, and an *error loci*, either of which he supposed capable of producing an obstruction in the circulation of a part, giving rise to increased action in the heart and other vessels, and exciting a flow of blood in the direction where the obstruction existed. He, however, felt the necessity of having the assistance of some other cause, to enable him to account more satisfactorily for the morbid terminations which occasionally happen, and therefore brought into play the humoral pathology, by stating that there is sometimes an acrimonious state of the fluids, which tends to produce gangrene.

That part of his doctrine relating to viscidity, cannot support the phenomena, the viscidity being more likely to produce a general than a local effect, since the whole mass of blood must be supposed to be in the same state. But there is rather more probability in the *error loci;* for it is a fact, that in inflamed parts, red blood enters into vessels which, in a state of health, circulate only a colourless fluid. But here there is some difficulty in determining whether or not the *error loci* is an effect, and not a cause of inflammation; and the difficulty is increased, when we reflect, that vessels frequently circulate red particles, which usually contain a colourless fluid, and yet inflammation has neither preceded, attended, nor followed this remarkable change.

On looking at the history of medical opinions on this subject, we shall observe, that, as the humoral pathology declined, Boerhaave's doctrines began also to lose ground, although the phenomena of inflammation were, in many cases, ingeniously explained by their assistance; and it must be confessed that we have abandoned this doctrine, which is far more ancient than the time of Boerhaave, without sufficient consideration.

Stahl and Hoffman attempted to improve Boerhaave's doctrines, by bringing into account the influence of the nervous system on the capillary vessels in inflammation. On this occasion, little need be said respecting the views of these celebrated men, as it will be necessary to resume the subject in a subsequent part of the work. But it may be noticed, that it has always appeared to me a strong proof of the close connection between the state termed fever, and that of inflammation, that almost every individual labourer in this field of investigation has adduced the same, or nearly the same doctrines, to explain the phenomena of both. Hence the pretty general belief as to their identity. But it will soon be my duty to offer many reasons for dissenting from this too sweeping pathology.

This slight notice of the opinions of Boerhaave, Stahl, and Hoffman, is sufficient to enable me to connect their views with those of modern date. The doctrines taught by Cullen were founded upon those of the last three physicians. He admitted the obstruction so much insisted on by Boerhaave, but denied

that it was produced either by *error loci*, or lentor of the blood. He also took advantage of the hint which had been given by Stahl and Hoffman, respecting the influence of the nerves, and insisted that the obstruction was produced by "spasm of the extreme arteries, supporting an increased action in the course of them." Cullen maintained this doctrine even in those cases in which external inflammations are occasioned by the application of boiling water, blisters, and other stimuli.

The only observation it appears necessary to make, after giving this slight sketch, is, that all these illustrious physicians have been guilty of confounding cause and effect. When we place a ligature upon a large vessel, we do not find that general inflammation of the limb follows as a matter of course, which nevertheless ought to happen if mere obstruction were the cause of inflammation. This obvious objection has not escaped authors; and it has also been remarked by the acute mind of Allan Burns, that the effusion from the capillaries into the cellular membrane, which takes place so frequently as the effect of inflammation, cannot be explained if the doctrine of spasm be admitted. Besides, Cullen has been guilty of a logical blunder, in attributing the proximate cause of inflammation to spasm of the capillaries, when, according to his own shewing, the spasm is occasioned by an accumulation of blood in these vessels.

According to John Hunter, inflammation is to be considered only as a distracted state of parts, which requires another mode of action to restore them to a state of health; or, in other words, that inflammation is a healthy action, which follows an injury of some tissue or organ. In another place, he states that active inflammation is to be considered as an increased action of the vessels, which consists simply, in the first instance, in a distension beyond their natural size. This he supposes to depend on the elasticity of the vessel, and a weakness of its muscular power. The whole of this he considers as a law of nature; and he seems to have believed, that the blood-vessels possess within themselves an innate active power of dilatation.

This leads me to state, that two modern opinions on this subject divide the profession. According to the one, inflammation

depends upon increased action of the capillaries of the part. According to the other, it is produced by debility or weakened action of the same vessels, and increased action of the trunks. On each side of this intricate and difficult question, are ranged the names of very eminent men; but, as will be shewn in the sequel, they might have spared themselves a great deal of trouble. Both parties found their opinions upon microscopical experiments, performed on the web of the frog's foot. Each observed the same phenomena, but they have drawn different conclusions. Dr Thomson, for instance, applied salt to a frog's foot; the first effect was to increase the velocity of the circulation, and to make the vessels larger to the naked eye, and of a brighter red colour. After the stimulant had been continued some time longer, the red globules became "less distinct than before the application of the salt, and obviously less distinct *from the rapidity of their motion.*"

Dr Wilson Philip performed experiments prior to Dr Thomson, on the frog's foot; and having first proved that he could create increased action in the capillaries without exciting inflammation, happened to meet with one unfortunate frog, who had already by some means contracted inflammation; and he found, upon applying the microscope, the vessels greatly dilated, and the motion of the blood extremely languid;—and he says, "It was at once evident, on observing the part through the microscope, that where the inflammation was greatest, the vessels were most distended, and the motion of the blood was slowest."

Dr Wilson Philip wetted the web of the frog's foot with *distilled spirit*, but although he continued to keep it moist for ten minutes, or a quarter of an hour, he could not perceive the slightest symptoms of inflammation. "The vessels, instead of appearing redder and more turgid, were evidently *paler* and *smaller* than before the application of the spirits." No wonder. Distilled spirit is the most deceitful application he could have used for such an experiment. In the first place it might stimulate the circulation in the part, but its quick evaporation would *necessarily* produce coldness, which, no doubt, caused *contraction* of the vessels, and rendered them *paler* and *smaller*.

Dr Hastings has subsequently repeated these experiments, corroborating those of the last named author. In all the experiments, whether performed by Thomson, Wilson Philip, or Hastings, the velocity of the blood is represented to have been increased in the capillaries, in the state of simple excitement; but it constantly happened, when inflammation commenced, that no globules could be seen in the blood of the affected vessels. Now, whether are we to join Dr Thomson in concluding, that they cannot be seen because of the "*rapidity of their motion*," or Dr Hastings and others, who state that the blood in an inflamed part, becomes itself morbidly changed, so that no globules can be detected? The point in dispute is thus brought within a very small space, and the reader is left to form his own opinions. The result of my investigations on the subject, shall now be detailed; and it may be stated, that this has not been done hurriedly, but after considerable experience, and a very careful review of all that has been written on Inflammation.

It appears to me, that the view taken by Mr Syme, in an Essay on Inflammation,* is the most correct. He thinks that too much attention has been directed to the obvious signs of inflammation, viz. redness, heat, swelling, and pain, and too little bestowed on the *altered functions of the part*. Mr Syme justly thinks, that "if this remarkable character of inflammation had been kept in mind, pathologists would hardly have spent so much labour in disputing about contraction and dilatation of the vessels, since it is obvious, that mere difference of capacity, though it might, to a certain extent, account for the redness and swelling, could never enable us to explain the alteration of function, any more than a knowledge of the size of capillary vessels could instruct us as to the mode in which their secretions, &c. are performed during health."—And he maintains, that "redness and swelling ought to be secondary considerations in the investigation of the inflammatory state, in comparison with the grand distinguishing character of *altered function*."

Three points seem to have been much overlooked by writers

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on Inflammation. 1*st*, The influence of the nervous system; 2*d*, The changes in the qualities of the blood itself; and, 3*d*, The disordered functions of the capillaries. I have performed experiments upon horses, which prove most satisfactorily the influence of the nerves, even in Chronic Inflammation. It is well known that these animals are very liable to inflammation in the foot, from different causes; and I have seen horses who had been lame for months, cured by dividing the nerves immediately above the fetlock joint, the effect being sometimes instantaneous, and occasionally permanent. With regard to the second point, there can be no doubt that the blood in the part affected becomes diseased; the red particles cease to be observed, and the blood assumes a flocculent appearance, becoming darker and darker, and the vessels become in some degree obstructed. It is not improbable that this change on the blood may be found to depend partly, if not principally, upon the cessation of nutrition and exhalation, and at the same time a stop being put to the conversion of arterial into venous blood.

It has been long known, that increased action of the vessels does not constitute Inflammation, as we see every day illustrated in the act of blushing, and by the employment of friction to any part on the surface of the body. In these instances, the vascularity soon subsides on the removal of the causes. But we can produce actual inflammation by a continuance of the friction; the blood will accumulate, and we shall have all the phenomena, and the usual effects of slight superficial inflammations. It may be produced also by obstructing the flow of blood in the limb for a sufficient length of time by applying a ligature, and this is what actually happens in a case of strangulated Hernia.

Diminished action of the vessels may be produced and maintained for some considerable time, and the effect will perhaps be, not inflammation of the part itself, but of another part of the body at a distance. Again, if inflammation has been excited in an organ, an increased flow of blood takes place towards it, and all other parts must consequently suffer from a diminished supply of arterial blood; this increases the embarrassment in all organs,—hence the general constitutional

disturbance. In the practice of Physic, this last circumstance is too frequently overlooked. Physicians are apt to expect a cessation of the constitutional symptoms the moment the original disease is subdued; this not being the case, they often push their remedies far beyond the proper point, and make matters worse. This is perhaps more peculiarly a British error, and we are justly condemned for it by our continental brethren. Other Physicians, again, do very great mischief by stimulating and throwing in bark and other tonics too soon after convalescence has commenced;—they will be found in the morning ordering a large bleeding, and in the evening a stimulant. Cases no doubt occur in which a more immediate change of treatment may be necessary; all that is wished to be impressed upon the reader in this part of the work, is, that such practice is too often had recourse to, more from an unfounded *dread* of the occurrence of "typhoid symptoms," than from real necessity; and that sufficient confidence is not placed in the powers of the constitution, to repair injuries which have been sustained. Physicians are too often found tampering with the human frame, as if it resembled a piece of machinery of their own construction.

The essence of inflammation, partly consists in more blood entering by the arteries than can escape by the veins, or than can be made use of, as when the part is in a state of health, when its functions are actively performed; the consequence is an accumulation of blood, or congestion and effusion from partial obstruction; and it is, I imagine, this degree of obstruction which produces the throbbing. The vessels of the inflamed part are greatly dilated, and the number which contains red blood is greatly increased.

It must be confessed, that in inflammation there is much undiscovered. Physiologists have to settle several disputed points in the doctrines of the circulation; and Anatomists have to discover a great deal regarding the Anatomy and Physiology of the capillary and nervous systems, before Pathologists can be expected to advance their part of the science of Medicine in any remarkable degree.

Considerable difference of opinion still exists among Physiologists, whether the circulation of the blood in the capilla-

ries depends entirely upon the *vis à tergo* it receives from the heart, or whether these vessels possess an impulsive power independently of the heart's action. Those who examine this subject without preconceived notions, and with no other view than to discover truth, cannot reject the *vis à tergo* which the whole column of blood is regularly receiving from the heart. Neither can they reject the action which the vessels possess from their elasticity, in aiding other parts of the machinery, not to mention their power of contracting themselves even into much smaller diameter than is natural to them, when circumstances require it for the preservation of life. With respect to the first point, it will be observed, that if one of the smallest arteries in the body, and at the greatest possible distance from the heart, be divided, the blood will be perceived to flow *per saltum*, the jets corresponding to the action of the heart. As to the second point, if the extreme vessels are quiescent, not possessing any power of acting within themselves, and depending entirely upon the action of the heart, how could irregular determinations of blood take place? When any internal organ is inflamed, we are taught, by experience and observation, to apply blisters and other irritants to the surface of the body, as a part of the remedial process. These applications excite a temporary inflammation on the surface, sometimes to the complete relief of the internal disease. This translation, as it may be called, is not affected through the agency of the heart, by the contractions of which the blood is propelled into the vessels generally; it can, in all probability, have no power to send blood to one part, in preference to another.

The results of experiments lead me to believe that some notable errors or oversights have been committed by Hunter, and many other experimenters upon the circulation. In the essay above alluded to, Mr Syme, in endeavouring to refute the received notions respecting the circulation in the capillaries, makes the following statements:—"In this case, also, we ought to discover, through the microscope, not only a change in the capacity of the capillaries, but an oscillatory movement of the globules passing through them. Instead of this, we see the capillaries apparently quite rigid and immoveable, while the globules shoot through them in such a free, uncon-

strained manner, as to convince every observer that they are not impelled by a *vis à tergo*." The results of one of Mr Syme's experiments are worthy of being quoted in his own words :—" I have repeatedly seen the globules continue in motion through the capillaries of a frog forty minutes after the whole heart was excised. And this motion was not uniform,—either as to direction or velocity, in which case the gradual contraction of the vessels might have been supposed adequate to account for it,—but sometimes this way, sometimes that,—at one time quick, at another slow,—and always continuing quickest as well as longest in the smallest vessels. While in health, the motion of the blood is slowest in the capillaries."

Having been an eye-witness to these experiments, I can add my testimony as to their correctness, and that every precaution was taken to guard against the possibility of any fallacy.

Before concluding this subject, I beg to enter my protest against the employment of the term " debility," as too generally applied to the capillary vessels of an inflamed part. If a man were able to walk three miles in an hour with an ordinary burden on his shoulders, it surely would not be correct to say he is in a state of debility, because he could not go over as much ground if he had to carry an additional hundredweight. This is exactly the condition of the blood-vessels ; they are well able to perform their natural functions, but when over-loaded, they are rendered incapable.

Causes of Inflammation.

In stating the Causes of Inflammation, it is my intention to avoid adverting to occult causes. In medical investigations, it is very injurious to science to affect being overwise, and it is surely more philosophical to confess our ignorance, than to attempt, by special pleading, to leap over difficulties, which, in the present state of our knowledge, are insurmountable. Instead of descanting at great length upon proximate, remote, exciting, and predisposing causes, it will be better to speak of common and specific Causes of Inflammation. The disease itself is improperly termed by Cullen

and others, the "proximate cause;" this term will, for a considerable time to come, be fostered by symptomatical physicians, who call the symptoms the disease, and the disease the proximate cause; but there is no reason why it should be retained in this work, unless it were employed to denote the proximate cause of the *symptoms*. As to predisposing causes, it is more consistent to take them into consideration, when treating of prevention of diseases; but many writers have been guilty of great absurdities even with regard to their influence in the production of disease. One author, with whose writings most medical men are well acquainted, in treating of the predisposing causes of hooping-cough, mentions, among others, "a serous temperament,—a scrofulous constitution,—dentition,—a disposition to contract catarrhal affections,—the retrocession of eruptive diseases."

The common causes in the production of internal inflammation are, exposure to cold; sudden vicissitudes of weather, particularly when the air is damp; irregularity of bowels; unwholesome diet; insufficient clothing; cold drinks, particularly when the body is warm; depressing passions, &c. Almost all these causes tend to produce inflammation in the same manner, by inducing irregular distributions of the blood and venous congestion. The lost balance of the circulation is marked sufficiently well in the beginning of almost all acute diseases, by the accession of rigors, coldness, and paleness of the surface of the body. Some individuals are more liable to inflammatory attacks than others, and some to inflammation of a particular tissue or organ. Such persons may well be said to be liable to, or susceptible of, such disease; there can therefore be no objection to the term in this limited application.

Few persons escape inflammatory affections produced by specific causes. The contagion of small-pox is termed a specific cause, because nothing is capable of producing the disease but its own contagion, in whatever way it is communicated. Measles is produced by a specific cause. Scarlatina also, and *perhaps* hooping-cough. Erysipelas is not to be ranked with these specific diseases, because it is not produced by a specific cause, as is too generally imagined. If erysipelas were produced twenty times, by inserting matter

taken from an erysipelatous surface, expressly for the sake of experiment, still it cannot be ranked as a specific disease, because it has also followed an injury produced by a splinter of wood, a perfectly clean sewing needle, a rusty nail, &c. It has also occurred after a prick received in dissection. No one ever alleged that small-pox, measles, or scarlatina, were ever produced in this fortuitous manner. It may be also mentioned, that there are other matters, the nature of which is unknown, but the effects of which are capable of producing inflammatory affections, viz. malaria, sometimes denominated marsh miasm, and human effluvia, together with another and still more mysterious agent, epidemic influence. But it appears to me, the great agent in the production of inflammatory affections is the sudden application of cold to the surface of the body, particularly when the stomach and bowels are out of order, and the mind depressed. Cold wet feet, for example, will sometimes produce determination to the head, and phrenitis will be the consequence ; or to the lungs, producing pneumonic inflammation, &c. Dr Thomson, in his work on Inflammation, states that this cannot be explained upon any principle. The doctrine of determination of blood explains it so far, and in my humble opinion quite far enough for all practical purposes. It is not, however, actual, but relative cold, which is so prejudicial to the human body ; it is exposure to cold when the body has been previously much heated.

An individual, after sudden exposure to a cold damp atmosphere, may be attacked by inflammation of the lining membrane of the air passages. It becomes an interesting and important question to determine upon what part of the human frame the cold air acts. Dr Thomson says, at page 57. of his work on Inflammation : " In some instances cold, or a diminution of temperature, seems to act more directly upon the parts with which it comes in contact. We have proof of this in the inflammation of the mucous membrane of the nose, fauces, trachea, and bronchiæ, from the inhalation of cold air." This is a most unhappy illustration. It is apparently a matter of little consequence how cold is the air that passes into the lungs, provided the body be sufficiently protected by warm clothing. In cold regions, if Dr Thom-

son's hypothesis were true, an individual ought never to be free from bronchitis. We are assured, however, that the sailors in the voyages of discovery, which were made by Captain Parry and Captain Ross to the North Pole, enjoyed remarkably good health.

There is another curious point which must be noticed. Extreme cold produces exactly the same sensations and the same effects upon the living animal fibre as intense heat. Take a piece of frozen mercury in the hand, and it will cause a sensation similar to that produced by hot iron,—inflammation and vesication follow; and if applied long enough, destruction of the part will take place. The hot iron destroys vitality by the addition of too much caloric; the frozen metal, by abstracting it too suddenly.

Division of Inflammation into varieties.

Inflammation has been variously divided and subdivided. The terms acute, sub-acute, and chronic, shall be employed in the course of this work, as being sufficiently precise, and well understood. It is wished to avoid the use of the term "passive," because it is employed too vaguely, sometimes to express the existence of sub-acute inflammation, at others that of the chronic kind. John Hunter also instituted the terms healthy and unhealthy. Is inflammation a disease? If it be, it is certainly not proper to call it healthy. Other varieties of inflammation have been mentioned, as scrofulous, gouty, rheumatic, erythematic, erysipelatous, &c.; but it is my belief, that as pathology improves, these terms will be less frequently employed. Another obvious division of inflammation depends upon the tissue or organ affected.

Phenomena of Inflammation.

External Inflammation is characterized by redness, swelling, heat, and pain. All these taken together, leave no doubt as to the existence of inflammation. In this respect, surgeons have the advantage of physicians. They can see and feel the part affected, in addition to the power of judging from the constitutional symptoms, and the account the patient gives of his own sensations. Whereas in physic we have

greater difficulties to encounter in forming a diagnosis. We observe local and constitutional symptoms also; but it does not always follow, because there are dyspnœa and fever, that the lungs are inflamed; the disease may be inflammation of the pericardium. There may be violent vomiting, tenderness in the epigastrium, thirst, with more or less fever, while the disease is in the head. There may be severe local and constitutional disturbance, without the existence of the slightest degree of inflammation, merely from a neuralgic affection of some tissue or organ, or from impeded function of some viscus. During life we cannot see the state of internal organs, to ascertain whether they are red and swollen; and a sensation of heat, pain, and fever, may exist without the least inflammatory action. It will be proved, in a subsequent part of this work, that the pulse cannot be depended on. With respect to buffy blood,* it may exist without actual inflammation; and, in inflammatory complaints, the blood does not always yield it. The shape of the dish modifies this appearance, as does the manner in which the blood flows from the vein. Mental agitation and fatigue produce the buffy coat. Sometimes it does not appear on the blood till the patient has been largely and repeatedly bled. I am inclined to place considerable dependence, however, on the buffy coat, *taken in connection with other circumstances*, particularly when the surface is also concave, or "cupped," as it has been termed, and when the quantity of serum is proportionably large.

It has often occurred to me to see dissections where great destruction of vital organs had taken place from inflammation, and yet there had been little or no pain complained of during life. Nay, I have seen instances of inflammation of the pleura to such a degree as to occasion death, where the symp-

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* Blood is said to be "buffy," when the surface, instead of being of a reddish colour, presents a yellowish crust of greater or less thickness. There are various opinions as to the cause of this appearance. Some attribute it to the slower coagulation of the blood; others to an increased quantity of fibrine; or merely to the hurried state of the circulation. Of one fact I am quite certain, from repeated observations, that blood may be seen to be buffed while it is yet flowing from a vein, and before the stream has reached the cup.

toms were too slight to direct the medical attendants to the true seat of the disease.

No pathological physician will join Dr Gregory, a modern writer on the Practice of Physic, in the following dogmas: "*Delirium marks inflammation of the brain; impatience of light, ophthalmia; hoarseness, inflammation of the larynx; and dyspnœa, that of the lungs.*" The practice of physic would indeed be simple and certain, were these things true. But this is not the proper place to enter upon a refutation of such arbitrary and erroneous assumptions.

The uncertainty of the pulse has been already mentioned. Inflammation may be going on towards a fatal termination, in an important organ, without any febrile movement. This was noticed long ago by Morgagni, Valsalva, and others, and it led them too hastily to conclude, that mortification of internal organs occasionally took place without the previous existence of inflammatory action.

What occasions the redness, swelling, heat, and pain, in external inflammations? The *redness* is occasioned, no doubt, by the enlarged size of the vessels, and the increased quantity of blood in the part affected. Vessels which formerly transmitted a lymphy fluid, now circulate red blood.

The swelling has been erroneously ascribed to the expanded state of the blood from increased heat; but it has been proved, that the blood contained in the vessels of an inflamed part, is not one degree hotter than that which flows from the heart; besides, a few degrees of caloric could have no effect in producing the swelling. It seems to be owing to the increased quantity of blood in the part, and the effusion of a lymphy fluid into the surrounding cellular substance,—the action of the absorbents being at the same time, in all probability, interrupted.

Heat.—Boerhaave and others imagined, that this symptom depended on the friction of the red globules against the sides of the vessels; and that, in inflamed parts, the friction is greatly increased by the obstruction which exists. This, like all Boerhaave's doctrines, is too mechanical. It is difficult to determine on what cause the increased heat depends, and fortunately for humanity, it is not of much consequence; but

it is probably in part owing to a peculiar action in the nerves of the texture, partly to the increased volume of blood, by which the *quantity* of caloric is augmented, although it be not indicated by the thermometer, but perhaps principally to diminution or suppression of the natural functions of the part.

Pain.—Pain in an inflamed part is not in general continued, it is most acute during the systole of the left ventricle of the heart. It would seem, that the state of the blood influences the sensibility of the body in disease; if the mucous membrane of the bronchial tubes be extensively inflamed, the circulating blood will be principally venous, in which case little complaint is made of pain.

Terminations of Inflammation.

Inflammation, (says John Hunter,) *cæteris paribus*, always proceeds more favourably in strong than in weak constitutions; for, when there is much strength, there is little irritability. In weak constitutions, the operations of inflammation are backward, notwithstanding the part in which it is seated may possess, comparatively speaking, considerable vascular activity.

This observation, like many others by the same author, however true with regard to surgical pathology, cannot be made to apply so universally in the Practice of Physic. We more frequently see acute diseases of internal organs, gallop through a rapid course to a fatal termination, in robust, than in delicate individuals. Persons with delicate constitutions frequently sink, while labouring under internal inflammations, not because the diseased action has any peculiar tendency to terminate badly, but because the patients are too weak to bear the necessary remedies.

In another place, Mr Hunter remarks:—"It has been supposed that different species or varieties of inflammation arise from the difference of the nature of the part inflamed; but this is certainly not the case; for if it were, we should soon be made acquainted with all the different inflammations in the same person at the same time, and even in the same wound; for instance, in an amputation of a leg, &c.....It is the adhesive in them all, if the parts are brought together;

it is the suppurative, if the parts are exposed." This observation, no doubt, in some measure holds true in surgery; but it cannot be admitted in physic, as it is well known that inflammation terminates differently in different organs and tissues.

The terminations of external inflammation are commonly styled "resolution; suppuration; ulceration; and gangrene." The first is, of course, the most desirable; and, fortunately for mankind, it is the most frequent. It is evinced by a diminution of pain and swelling,—the fever gradually abates, pus does not form, nor does the structure of the part suffer permanent injury.

The second termination is that termed Suppuration. After the inflammation has existed for a certain time, which varies much in different persons, pus begins to be secreted in the cellular substance, and either collects in one cavity, as in common phlegmon, or is diffused very generally over a whole limb, as in phlegmonous erysipelas.

Ulceration is the third termination mentioned.

The most dreaded termination, and fortunately the rarest, is the entire death of the parts affected, which are then said to be mortified or sphacelated. This condition is recognized by the sudden cessation of pain; the part, from being of a bright red colour, assumes a dusky hue; it crepitates from the extravasation of air in the cellular substance, vesications arise, a very peculiar odour is perceived, the pulse sinks, and every appearance announces speedy dissolution. Death, however, does not always follow mortification of external parts; the dead are sometimes separated from the living parts, and are ultimately thrown off, the patient surviving the injury.

It is now necessary to mention shortly the effects of inflammation in the following textures: 1. Skin. 2. Mucous membranes. 3. Cellular membrane. 4. Fibrous membranes. 5. Serous membranes. 6. Inflammation of the solid viscera and glandular system.

1. Inflammation of the skin.

The effects of inflammation on this part of the body are very various: such as the formation of rashes, as in Scarlatina, Roseola, &c.; pustules, as in Small-pox, Porrigo, &c.;

vesicles, as in Chicken-pox, Herpes, &c.; papulæ, as in Measles, Lichen, &c.; scales, as in Lepra; ulceration with loss of substance; and also gangrene.

2. The effects of inflammation on mucous membranes, are, swelling and dryness; effusion of mucus, or of matter of a puriform character—a mixture of the two, appropriately termed muco-purulent; of a serous fluid, and coagulable lymph. These different products of inflammation are sometimes colourless, at others yellow, and sometimes red like currant jelly. The mucous membranes are likewise liable to softening, thickening, passive hæmorrhage, ulceration, contraction, sloughing, and tubercular formation.

Some of these effects are common to the mucous lining of the air passages, alimentary canal, and urinary passages, as for instance, copious exudation of mucus, softening, thickening, and passive hæmorrhage. Others are not so; tubercular formation, for instance, is more frequently met with in the alimentary canal. Ulceration is sometimes found in the air tubes, but more frequently in the stomach and bowels, particularly the latter, rarely in the bladder. Some parts of the mucous membrane of the same canal are more liable to inflammation and ulceration than others; for instance, the termination of the Ilium and the Colon. Inflammation is more liable to terminate in the exudation of coagulable lymph in some parts than others; it is seen most frequently in the wind-pipe and rectum, although other parts are not altogether exempt.

Considerable vascularity is not alone a certain proof of inflammation having existed in the mucous membranes before death, because it may be found only in depending parts of the canals; and congestions of this membrane may be occasioned by diseases of the heart and lungs, and by any other cause which obstructs the circulation of the blood.

3. Inflammation of the cellular membrane terminates in effusion of blood, of lymph, of serum, of pus;—in induration and gangrene. Inflammation in this tissue is generally termed phlegmonous, and although the cellular membrane is so extensive and loose in its texture, the disease tends to circumscribe itself by a sanatory process, and the effused matter to make its way to the surface of the body. Occasionally, though

rarely, the inflammation has a tendency, from the first, to spread very extensively, from peculiar circumstances which have never been satisfactorily explained. To express this condition, several new-fashioned names have been invented; the one most applicable, is, "diffuse cellular Inflammation." Sometimes the death of a small portion of the cellular membrane takes place, then the affection is called carbuncle.

4. Inflammation of fibrous membranes. This is the tissue which is generally supposed to be affected in gout and rheumatism; the chief peculiarities are said to be, that it never terminates in suppuration, ulceration, or gangrene, and the functions of the brain are rarely disturbed during the course of the disease. It is said to terminate sometimes by effusion of a gelatinous nature, or deposition of calcareous matter. This subject ought to be held as being open to future investigation; it is by no means proved that the inflammation which attends gout or rheumatism is situated in such a texture. All the phenomena and the terminations of these diseases, tend to confirm a suspicion, that it is seated in the extremities of nerves, more particularly when we reflect upon the sudden metastases. At all events, it is rather strange that so many authors should make the assertion, that inflammation of fibrous membranes *never* terminates in suppuration and ulceration. What do they call the periosteum? But this question is too intricate and extensive, and some may think, too surgical, to be investigated in this work.

5. Serous membranes in a state of health show few red vessels, and their surfaces exhale a thin serous fluid, which is just sufficient to bedew them. When inflamed, red vessels are seen during life, an effusion takes place either of serum or lymph, or of both. Sometimes the effusion is limpid, or turbid like whey: at other times it looks like pus, and occasionally it is greenish, or resembles lees of wine; often large masses of coagulable lymph are discovered glueing the parts together. Adhesions between the different viscera of the thorax and of the abdomen seem to be effected by means of intervening portions of lymph, which subsequently become organized. The quantity of the effused matter is sometimes small, amounting only to a few ounces, at others there are

several pounds. I have seen ten, twelve, and even twenty pounds in one side of the chest.

A bloody effusion is sometimes found, more particularly in the abdomen. Ecchymosis not unfrequently takes place when the inflammatory action is very violent. There can be no doubt that tubercles form *occasionally* under a sub-acute and chronic inflammation of this class of membranes, more particularly in the peritoneum, pleura *pulmonalis*,* and arachnoid coat. Emphysema also occurs in the cellular tissue immediately under the peritoneum. It has been proved by experiment, that the peritoneum, however vascular under acute inflammation during life, loses its red appearance even during the act of death. In chronic inflammation, it is sometimes found very red in colour, and thickened in texture.

Much has been written during the last few years upon inflammation of the arachnoid, by which science has certainly been benefited; but it appears to me that considerable misconception has taken place upon this subject. Although red vessels are rarely to be seen in the arachnoid, so rarely that in my whole life two undoubted instances only have presented themselves, yet no one who has paid attention to the situation of effusions of matter within the skull, will deny the existence of inflammation in that tissue. But it is comparatively rare. In my examinations (and they have not been few in number) to ascertain this point, it has not occurred to me above six times to find effusion external to the arachnoid membrane. If, on examining the abdomen, we were to find no vascularity, and no adhesions, or effusions of serum or lymph, within the cavity of the peritoneum, but were to discover the effusion on the other side of the membrane, extravasated for instance in the cellular tissue which connects the serous membrane to adjacent parts, should we be entitled to say, from any thing we yet know, that this was a consequence of peritonitis? In the cases to which reference has been made, the effusion is between the arachnoid and the pia mater, which are united by fine cellular substance —*the wrong side*, if it proceeded from diseased action in the

* Tubercles are rarely seen in the pleura costalis.

former membrane, unless it has two serous surfaces, which is not maintained by any anatomist. There is not, perhaps, in the whole body, a more vascular membrane than the pia mater, and I cannot avoid concluding that the effusions, not only on the surface of the brain, but also in the ventricles, depend more on diseased action in this, than the other membrane.

Ulceration is also to be considered as an occasional, although rare, effect of inflammation in serous membranes. It has presented itself to me three or four times only. There are three splendid specimens of this change in my museum, two of ulceration of the pleura pulmonalis and costalis, the other, of the membranes on the surface of one of the hemispheres of the brain.

Gangrene is one of the rarest results of inflammation of serous membranes, and it is to be doubted whether it ever occurs when the diseased action is confined to this tissue.

6. Inflammation of the solid viscera and glandular system. The first circumstance generally perceived is the presence of an unusual quantity of blood in the affected organ. The first change in the structure of the viscus is softening. Hardening is owing, in general, to chronic inflammation. With respect to inflammation of the solid viscera, it is to be remarked, that if the liver be excepted, the termination in the formation of abscess is rare. In the lungs, it is admitted by the best authorities to be rare; I have seen it once only in the substance of the lungs. In the brain, it is probable that the peculiar change which has been denominated *ramollissement*, and the remains of old apoplectic effusions, together with tubercular degenerations, have been often mistaken for abscesses.

Tubercles are found in the substance of various organs, as in the liver, spleen, kidneys, lungs, and brain; and there can be no doubt these are sometimes the result of inflammatory action, but no one is warranted in asserting that they are invariably so produced. I have frequently found in the lungs, and in the substance of the brain, depositions of a tubercular character, which were certainly not caused by inflammation, and which, in all probability, had been in existence for years without exciting inflammation. This statement refers to

persons who were either killed by accident, who died suddenly without any previous complaint, or who were carried off by other diseases. One of the finest preparations in my collection, is the heart of a woman, extensively and deeply tuberculated, who died in a moment without a previous complaint, and no other lesion could be discovered.

Lastly, Inflammation affecting glands, has an aptitude to terminate speedily in suppuration. Sometimes, however, they suppurate very slowly, and occasionally induration takes place.

From this rapid sketch, it may be thought that the subject has not attracted a sufficient share of my attention, and that several points have been altogether overlooked; such as the marked difference in the constitutional symptoms in inflammations affecting different tissues, and the general principles of treatment. The truth is, that the importance of these points is felt too deeply to allow me to treat of them in a general description,—a description, moreover, which ought necessarily to be very short. These subjects will be fully entered into in subsequent parts of the work.

CHAP. II.

ON FEVER.

HISTORY OF THE GENERAL DOCTRINES OF FEVER.

The importance of the subjects which are to be discussed in this chapter is very great, from the frequent occurrence and often fatal termination of this class of disorders; and it will appear still more so, when we reflect on the great extent of our dominions abroad, where, it is believed, febrile diseases carry off more than four-fifths of those who die.

If a person, after shivering, feels hot, restless, and thirsty, has a quick pulse, and complains of languor, he is said to have a fever.

Galen's notion of fever appears to have been, that an extreme degree of heat is formed in the heart, and from thence extends itself to the rest of the body. It is one of the oldest notions in medicine, that fevers are produced by a concoction of something pernicious to the system, which is expelled by a critical effort of nature, as, for instance, by frequent and copious evacuations from the bowels, free perspiration, &c. This is the view of fever taken by the humoral pathologists.

According to Boerhaave, fevers arise from the same pathological causes as inflammations,—thus ascribing them to viscidity of the blood, *error loci*, and an acrimonious state of the fluids. He conceived that the cold stage of fever was produced by the *error loci*, and all that followed was to be regarded as natural consequences. As has been mentioned in treat-

ing of inflammation, the first idea which appears to have been given to the world, of the influence of the nervous system in the production of fever, originated with Stahl, and it was improved upon by his colleague, Hoffman. They supposed that fever consisted in a tonic spasm, produced on the extremities of the nerves by a deficiency of action in the brain. They also adopted the humoral pathology; but insisted, that the sanative process was impeded by the spasm at the extremities of the nerves, thereby preventing the disease from being thrown off; and it appears to have been their opinion, that it was this resistance which produced the constitutional commotion which attends fevers.

According to Cullen, the human body is composed of certain organs, whose actions are regulated according to laws peculiar to animal life, and superintended by a mobile and conservative energy which is situated in the brain, acting wisely but necessarily for the general health, preventing mischief and repairing injuries, by a pre-established relation between the changes produced, and the motions required for the restoration of health, which actions are performed by the nerves. According to him, the muscular filaments are merely the extremities of nerves. He supposed that fever is produced by a collapse or diminution of the energy of the brain, in consequence of the influence of contagion, miasm, cold and fear acting as sedatives. This diminished energy produces a universal debility, and causes a spasm of the extreme vessels, and in this spasm the cold fit is supposed to consist. In fact, that fever is nothing more than diminished energy of the brain, and spasm of the capillaries. He conceived that the debility proves a stimulus to the circulating system, exciting increased action of the heart and arteries, which continues till it restores the energy of the brain; by removing the cause of the spasm of the extreme vessels, relaxation takes place, and health is restored by a copious sweat, or discharge of some of the other excretions. He divided the whole phenomena into three stages; *first*, the stage of diminished energy of the brain, and consequent debility; *secondly*, that of spasm of the extreme vessels; and *thirdly*, all that follows till the commencement of the sweating stage. Perceiving his doctrines

to be exceedingly weak, Cullen sought support from certain powers which are supposed to be inherent in the constitution, which enable it to resist and throw off disease, commonly called the *vis medicatrix naturæ*. But it is important that he should here speak for himself. "Upon the whole, our doctrine of fever is explicitly this:—The remote causes, are certain sedative powers applied to the nervous system, which, diminishing the energy of the brain, thereby produce a debility in the whole of the functions, and particularly in the action of the extreme vessels. Such, however, is, at the same time, the nature of the animal economy, that this debility proves an indirect stimulus to the sanguiferous system; whence, by the intervention of the cold stage, and spasm connected with it, the action of the heart and large arteries is increased, and continues so, till it has had the effect of restoring the energy of the brain, of extending this energy to the extreme vessels, of restoring their action, and thereby especially *overcoming the spasm* affecting them; upon the removal of which, the excretion of sweat, and other marks of the relaxation of excretories, take place. This doctrine will, as I suppose, serve to explain, not only the nature of fever in general, but also the various cases of it which occur."

It is remarkable that Cullen, who has insisted with so much pertinacity on spasm of the extreme vessels being a principal part of fever, should so completely have forgotten himself, as to assert that *atony*, which is the very reverse of *spasm*, is also a principal circumstance in the pathology of fever. But he shall again speak for himself. "From the whole we have now said on the subject, I think it is sufficiently probable, that the symptoms of anorexia, nausea, and vomiting, depend upon, and are a proof of, an *atony* subsisting in the extreme vessels on the surface of the body, and that this *atony*, therefore, now ascertained as a matter of fact, may be considered as a principal circumstance in the proximate cause of fever." "This atony we suppose to depend upon a diminution of the energy of the brain; and that this takes place in fevers we conclude, not only from the debility prevailing in so many functions of the body mentioned above, but particularly from symptoms which are peculiar to the brain itself."

The meaning of "spasm of the extreme vessels," is morbid contraction; that of atony of the extreme vessels, is a defect of muscular contraction. Can a morbid contraction, and a morbid relaxation, co-exist in the same vessels at the same time? This contradiction appears to me to be quite unparalleled,—it always surprised and disappointed me in the investigation of this subject; and it is astonishing that doctrines founded upon such statements should still be maintained. In the present improved state of pathology, it is almost unnecessary to enter into proof, for the purpose of shewing the error of attributing to spasm of the extreme vessels any part of the pathology of fever; but it may be mentioned that, in some fevers, copious perspiration takes place through their whole course; and, even in the cold stage of intermittent, the surface is occasionally covered with moisture. *

It appears that Cullen and others always confounded debility or actual weakness, with oppression from obstructed action. The debility which depends upon obstructed action is very different from that produced by starvation, a protracted disease, or great loss of blood, &c.; it is mere oppression, occasioned by the loss of balance between the arterial and venous systems: and the proof consists in the well known fact, that upon the restoration of that balance, the overpowering sensations of weakness vanish, even when brought about by blood-letting, which is a remedy directly debilitating. If debility formed such a regular and indispensable part of fever, as the Cullenians assert, three circumstances ought to follow as necessary consequences. 1*st*, Weakness, produced in so many different ways, should invariably excite fever. 2*d*, Once a fever is lighted up in the system, it ought to be impossible to extinguish it, and particularly by any antiphlogistic means; and, 3*d*, The longer such an action continues, the greater will be the debility, and therefore the febrile symptoms ought to become more and more intractable.

The term "diminished energy of the brain," being a prin-

* I have written more fully upon this subject, to shew the great absurdity of the doctrines of Cullen, in a paper in the Medico-Chirurgical Review for January 1828.

cipal part of the foundation of Cullen's doctrines, cannot be allowed to pass without notice. It is one of those vague terms too often used by him to express a great deal more than we actually know, but which in reality explains nothing. It is one of those expressions which satisfies the youthful mind, without affording instruction or exciting inquiry. What is the natural energy of the brain? How is it propagated? It would be very satisfactory if the living advocates of this system would inform us, at what period of the disease the energy of the brain exists in its most perfect state, and greatest strength. Is it at the period of attack, or *at its termination?* It appears to me to be most unphilosophical to treat of diminished energy of the brain as a principal part of any disease, because it has no precise meaning. It can be of no use in explaining the nature and seat of fever, and of still less service in directing the plan of treatment.

Cullen too hastily rejected the humoral pathology, and seems unfortunately to have almost entirely disregarded the effects produced by outward causes, and inward irritations, in producing irregular determinations of blood, and local engorgements, which, I shall hereafter attempt to shew, are the great agents in exciting diseases, and especially fevers. It may be noticed in this place, that Dr Mason Good, in his large and laborious work, advocates the truth of the chief parts of the Cullenian doctrines.

According to Dr Brown, man is made of organized materials, endowed with a principle of excitability or predisposition to excitement, by means of a great variety of stimuli, some of which are constantly acting upon the machine. This excitability, in point of fact, is nothing more than the nervous energy of Dr Cullen; it is the principle of life, or life itself. It is, according to Brown, constantly varying in its accumulation and exhaustion; yet it differs somewhat from the nervous energy of Cullen, which is influenced by something unconnected with the matter of organization, and which he terms "*vis medicatrix naturæ*,"—whereas Brown's excitability is passively exposed to the effects of such stimuli as it may chance to meet with, and yields to their influence. He divided all diseases into two classes: the first, caused by ac-

cumulated excitability, and marked by direct debility; to this class he gave the name of *Sthenic*. The second, produced by exhausted excitability, and marked by indirect debility; this class he termed *Asthenic*. And his treatment is as simple as the arrangement, viz. in the first case, to reduce the excitability by antiphlogistic means; and in the second, to increase the excitability by an opposite treatment. It can scarcely be believed, that an author who acquired so much reputation, could have been guilty of publishing such nonsense on a point of such vital importance, as the following:— "In order both to prevent and cure diseases, we must always use the indication proposed, and stimulate or debilitate; never wait or trust to the supposed powers of nature, which have no real existence."—*Elements of Physic, vol.* I. *p.* 81. It is surprising, considering that his works abound with absurdities equally glaring, that Dr Brown should have made any converts; and it is not very creditable to the age in which he lived, that it should be told he had numerous followers,—but they soon began to fall off; and it is curious, that in proportion as they declined in number at home, they increased abroad, and are at this very moment, with some modifications, in considerable force in Italy, notwithstanding the exposure of the fallacies of the system made by Rasori.

Dr Darwin improved the Brunonian doctrines, in so far as he makes the brain the common fountain, from which every other organ is supplied with sensorial fluid. He regards the sensorial fluid as a mere secretion, capable of being exhausted in four different ways, through the agency of four separate faculties which he ascribes to it.

1*st*, The faculty of *Irritability*, exhausted by external stimuli, affecting simple irritable fibres.

2*d*, Of *Sensibility*, exhausted by stimuli affecting the fibres of the organs of sense.

3*d*, Of *Voluntarity*, exhausted by stimuli affecting the fibres of those organs which act in obedience to the will.

4*th*, and lastly, of *Associability*, exhausted by stimuli affecting organs associated in their actions by sympathy or long habit.

By each of these means, Darwin supposes the sensorial

power becomes evacuated, as by food and rest it becomes replenished, often indeed with an accumulation or surplus stock of power. He therefore considers the occasional causes of fever, (whatever they may be), as inducing a torpor of the extreme arteries, and the subsequent heat, as an inordinate action of the sensorial power hereby accumulated to excess.

This subject might be pursued much farther, but a more minute detail does not consist with the plan of this work, particularly as the individuals whose names have been mentioned have bewildered themselves with theories, have substituted mere conjectures for facts to which they have given appellations, have replaced one mystery by adding another quite as inexplicable, and seem to have considered the subject without reference to morbid dissection, or to the habits and modes of living in different societies and climates.

I still have to mention the doctrines of more modern pathologists, which are alleged to be founded on morbid dissection. Some of these contend that fever (or as they term it, the proximate cause of fever) depends upon inflammation of a particular organ. Thus it has been attributed to inflammation of the brain—of the liver—of the digestive organs generally—of the mucous membrane of the stomach and intestines particularly —and of the arteries and veins.

It is necessary to caution young practitioners, and more particularly those commencing the study of medicine, against implicitly receiving the arbitrary doctrines of fever which divide the profession in the present day, viz. that fever is invariably produced by inflammation of one viscus, or set of viscera.

Dr Clutterbuck, a Physician of reputation in London, has most ingeniously attempted to prove, that fever depends upon some degree of inflammation of the brain. In reviewing the merits of his system, it must be kept in view, that he practises in the greatest commercial City in the Universe, among a people whose minds, generally speaking, are more actively employed than their bodies, who are exposed to intense anxieties, occasioned by extensive speculations and reverses of fortune, who are either in a state of considerable mental excitement or depression. If to these considerations we add the effects of

heavy meals and sedentary habits, impeding the functions of the stomach and bowels, it will be seen, that there may be considerable foundation for the opinions this gentleman has been led to advance. But I object to the arbitrary application of his doctrines.

Broussais, to whom the profession stands greatly indebted, and whose merits, like those of many others, have been more justly estimated abroad than at home, asserts that all fevers may be referred to gastro-enteritis, simple or complicated. In France it is no wonder that Broussais should so frequently find the mucous membrane of the stomach and intestines altered both in appearance and structure, if the habits and modes of living of the people are recollected. The stewed meats, salads, oils and sweets, consumed by Frenchmen among the higher ranks, together with the hard beer and acid wines which they drink, and the unwholesome food eaten by the lower ranks, all tend to produce irritation in the digestive organs. Sooner or later, these irritating matters produce increased vascularity, which must frequently terminate in inflammation and ulceration. It is easy, therefore, to account for the doctrines of Broussais, and for the tone in which he supports them; and while I allow him every merit and commendation which is so justly his due, I cannot help objecting to the arbitrary manner in which he wishes to apply them.

There are other individuals of the present day, who assert that fevers have never any connexion with inflammation, except in as much as they occasionally excite it in their progress; and in alluding to the appearances so frequently found on dissection, they triumphantly but erroneously allege, that such appearances are the effect, and not the cause of the disease. Change of structure is certainly only a consequence of previous disordered action, but in fever it is not always difficult to trace the progress of the local disease, from the beginning of the disordered action till the structure of the part is injured. There are many persons who imagine that inflammation cannot exist in any organ or tissue of the body, in any degree, without a strong and quick pulse, thirst, restlessness, and considerable pain. Fatal error!

The war of opinion in France, respecting the pathology of

fever, is at present too great to entitle us to expect candour from all the combatants. Much talent is already in the field, and when the stage of excitement is over, the science of Medicine will probably be found to have gained very considerably. Some are ready to assert the universal truth of the *new doctrines* at the point of the sword, while others as strenuously, and apparently as sincerely, deny them. New advocates are daily coming forward on each side; and while we may express our admiration of the zeal, ability, and assiduity, displayed by so many individuals, still I cannot avoid stating my conviction, that their services would be more useful to suffering humanity, if many of the authors thought more, and wrote less. From this reflection, I would beg to exclude the truly valuable works of Broussais, Andral, Laennec, Boisseau, Bailly, and many others; but even with respect to these, if that of M. Bailly is excepted, it is melancholy to reflect upon the little practical benefit they have themselves derived from pathological investigations. They have filled large volumes with cases and dissections, but their practice is too *expectant* on most occasions, and generally weak and vacillating. Having already expressed myself candidly respecting the errors of authors of our own country, I may be permitted to do the same with respect to those of the French School; and I must further add an expression of surprise at the little acquaintance with British medical literature, which even their best writers display. Frequent opportunities will occur, in the course of this work, to quote with benefit to my readers, many important facts from French works; but in this doctrinal history, it would be of little service in general, and occasionally would make "darkness visible."

It is now time that I should state the views which I have been led to form on this important subject.

First, Fevers may depend on inflammation of an acute, but more frequently of a sub-acute nature, of some organ or tissue of the body. If the inflammation be acute, the febrile symptoms will be correspondingly severe; but if sub-acute, they will assume a slighter form. It ought to be mentioned in this place, that the symptoms and terminations are variously modified by the organ or tissue inflamed.

Secondly, Fevers very often depend upon mere functional derangement of some organ, having as yet no connexion with inflammation; and here again we have a modification of the symptoms and terminations according to the organ principally diseased.

Thirdly, Fevers sometimes depend on the mere loss of balance in the circulation, producing local congestions; fevers arising from these last two causes are generally called *idiopathic*.

After having watched the progress and termination of fevers in various climates, I have been led to conclude, that the nature and seat of fever is pretty much the same in all constitutions, in all climates, and under all circumstances; the leading difference being in intensity, and the rapidity with which some run through their course; being sometimes connected with inflammation, sometimes not; at other times depending on functional disorder of some important organ of the body, and also upon lost balance of the circulation, by which means some local accumulation of blood takes place.

Some have supposed, from the tenor of the papers which were formerly published by me, that I deny the influence of the nervous system in the production of fever; but this is far from being the case. It would as soon occur to me to question the laws of gravitation. I have always maintained the existence of a strict connexion between the vascular and nervous systems, in producing and keeping up febrile and inflammatory diseases.

There can scarcely be a doubt, that a disordered state of the functions of the brain, and other parts of the nervous system, occasionally gives rise to febrile action. It is impossible to deny to the brain, as an organ, that it may be disordered, like other viscera, in function, as well as diseased in structure. My ideas of fever may be summed up in the words of Dr Fordyce, one of the best and most original writers upon the subject. "A fever," says he, "is a disease that affects the whole system; it affects the head, the trunk of the body, and the extremities; it affects the circulation, the absorption, and the nervous system; it affects the skin, the muscular fibres, and the membranes; it affects the body, and affects likewise the mind. It is, therefore, a disease of the whole system in every

kind of sense. *It does not, however, affect the various parts of the system uniformly and equally; but, on the contrary, sometimes one part is much affected in proportion to the affection of another part.*"—Dissertation on Simple Fever, Part I. p. 27.

It appears to me, that certain general views closely touching this question are admitted by all writers whose opinions are of any value, although the same facts have been called by different names, and have led observers to draw opposite conclusions.

1*st*, That the functions of almost all organs are embarrassed in fever from the very beginning, and often for days before the sense of coldness is felt by the affected person.

2*d*, That the blood leaves the surface of the body, and accumulates in internal organs, and that, unless they are overwhelmed, the system makes an effort to relieve herself, and certain combined phenomena take place, which are designated by the terms "Re-action, Fever." A question has arisen to determine by what means this is effected. There can be no doubt that it is owing to the principles of life. There are two circumstances, in following which investigators have bewildered themselves; one is, the vain attempt to ascertain the first link in the chain of diseased action; the other is, the still more hopeless endeavour to discover the principle of life, which perhaps no man will ever be able to unravel.

3*d*, That inflammation of all parts of the body will give rise to fever.

4*th*, That inflammation may supervene during fever, without being the primary cause of the febrile commotion.

5*th*, That the nervous system is involved as well as the vascular; and,

6*th*, It follows as a consequence, if all these things be true, that the blood itself must be in a diseased condition.

This outline of my opinions must suffice at present,—it will be best filled up when treating of the pathology of individual fevers,—when an attempt will be made to account for the discrepant histories which have been given of fevers, and for the varieties of treatment recommended by different authors.

Division of Fevers.

Fevers have been divided into various kinds. Dr Mason Good has four orders, thirteen genera, and each genus has several species. This is a very erroneous plan in writing as well as teaching; for every individual case has some peculiarity, so that this very learned author might with as much propriety have made many millions of species.

It was the opinion of the celebrated Dr Rush, that it is "*not more improper to say that men are of different species, because some are tall, and others short, or because some are long, and others short-lived, than that fevers are of different species, because they vary in their symptoms and duration.*"

Cullen has divided fevers into Intermittent, Remittent, and Continued, and this last is subdivided into Synocha, Typhus, and Synochus.

It is my intention to reject the term "*Idiopathic,*" * as applied to fevers, which I consider a most unhappy term, being one respecting which no medical man with whom I am acquainted can give a satisfactory definition. It seems to be a disease beyond the pale of pathology, having neither nature nor seat. It is defined by some to be a fever without a cause. Fever is alleged to be a certain combination of symptoms, but it cannot be said that this is the disease. The symptoms are to be regarded as evidences of a diseased condition of some part or parts of the system; whereas, those who speak of idiopathic fever, will be found very frequently to do so, either from habit, or from a dislike to change terms, they themselves having a particular meaning for it. But the schoolmen who are in the habit of using this term, I verily believe, do so from an erroneous impression that the symptoms are the disease, and it is understood that some of them even go the absurd length of treating of Idiopathic Hectic!

The terms Adynamic and Ataxic have been also avoided in this work, because there seems to be no good practical reason for their employment.

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* The fevers said to be "*Idiopathic,*" are "Intermittent, Continued, and Exanthematous."

None of the arrangements which have been hitherto laid before the profession, exactly meet my views; and in so far as I have been able to observe the phenomena of fever, I believe they may be advantageously arranged under the following heads:

1*st*, Intermittent Fever.

2*d*, Remittent or Yellow Fever: Infantile Remittent.

3*d*, Continued Fever, subdivided into four orders, viz.

Fever from functional derangement.

——— from inflammation.

——— from congestion.

A mixed form of fever between these three last, but in which congestion predominates, commonly denominated Typhus or Synochus.

4*th*, Hectic fever.

5*th*, Fevers attended with eruptions, subdivided as follows:

Scarlet fever.

Measles.

Small-pox.

——— modified.

Chicken-pox.

Miliary fever.

Roseola.

Urticaria.

6*th*, The Plague.

General description of the phenomena of Fevers.

The following are Cullen's definitions of febrile diseases, and of fever:

First, of Pyrexia.

"After shivering, succeed a quick pulse, increased heat, with interruption and disorder of several functions, diminution of strength, particularly of the joints."

Secondly, of Fever.

"After languor, lassitude, and other signs of debility, pyrexia, without any primary local affection."

There are the strongest objections to all medical definitions. The following may be urged against the two above quoted; they are *symptomatical* definitions, and it is well known by

physicians of experience that the symptoms vary much according to constitution, climate, and habits of living. They vary even in different individuals belonging to the same family, and during the same epidemic. The symptoms develope themselves in various degrees; one symptom, when exceedingly severe, frequently conceals or disguises the others. A definition, to be useful either to the student or the young practitioner, should embrace such phenomena as are peculiar to that particular disease, and which never attend any other,—phenomena which may be therefore said to be pathognomonic of the affection. As has been already stated, there is no case of fever, or indeed of any other disease, which has not some peculiarity that distinguishes it from another of the same family; in truth, the symptoms of diseases have a very wide range of character. A definition, giving a sketch, not of the symptoms, but of the *nature and seat of the disease*, would be a most useful introduction to the practice of physic; but pathology, unfortunately, is not yet sufficiently advanced to enable me to adopt such a plan in this work.

It may be asked why Cullen, in his definition of fever, has taken no notice of pain in the head and in the loins, delirium, and coma, of oppression at the præcordia, of nausea, want of appetite, thirst, and the state of the tongue? The reason appears to me to be evident; the mention of these phenomena would have led to the suspicion of *local affection*, which was contrary to his own dogmas.

"Fever," says Dr Fordyce, Part 1st, p. 7, "of all other diseases, is that one in which a pathognomonic symptom is least to be depended upon; that is to say, an appearance which does not take place when there is no fever, or a fever does not take place when there is no such appearance."

Febrile diseases sometimes commence without any rigor, and go through their whole course without any unusual heat of skin, quickness of pulse, or thirst. The rigor is not always followed by increased heat. Languor, lassitude, and other signs of debility, are symptoms common to almost all diseases, and therefore should not be ascribed to fevers in particular.

It is impossible to give a good general account of the phenomena of fevers, because, in addition to the objections urged

above, they vary every day in the course of the disease. The symptoms which appear in the accession of fever, differ from those which manifest themselves in its progress; and these again from those which are observed in the decline and termination. These differences have given rise to a division of every fever into stages:

1. That of accession.
2. ——— increase.
3. ——— declension.
4. ——— collapse.

These stages have been differently named; the first is sometimes called the stage of oppression and depression; the second, that of re-action; the symptoms occurring in the third and fourth stages, have too frequently been called typhoid.

The symptoms vary also according to the organs chiefly affected. In some cases there are decided cerebral symptoms, from the very beginning, indicated by headache, intolerance of light and sound, *tinnitus aurium* and delirium, or stupor with low muttering delirium, and sometimes *coma*, &c. In other cases the viscera of the thorax are principally affected, indicated by dyspnœa, cough, expectoration, and tightness in the chest, &c. In a third set of cases, some of the viscera of the abdomen are implicated, announced by nausea or vomiting, uneasiness increased on pressure, obstinate constipation or diarrhœa, a morbid state of the alvine evacuations, discovered both by their appearance and odour; a tympanitic state of the abdomen, and peculiar appearances of the tongue. Occasionally in the course of the fever there are evidences of acute or sub-acute action in all the three great cavities, and this is what occurs in the worst forms of yellow and malignant fevers.

In fever the functions of every organ are more or less disturbed, so that there is the best proof of universal disorder, and the appearances so frequently seen on dissection warrant this inference. True it is that we now and then, on examining the body of an individual, find no very decided morbid appearance.* This is by no means peculiar to the prac-

* This is seldom the case, however. The only places in which the physical

tice of physic; for, in that of surgery, people sometimes die after capital operations, where there has been no loss of blood, and no organic lesion found upon dissection, to explain the cause of death. They are said to die from the shock, by which term I understand that the principal functions of the body become suddenly impeded to such a degree that life can no longer be carried on. In the same way, in fevers, individuals die before any alteration of structure has taken place; from peculiarity of constitution, they cannot stand the shock produced by the embarrassment of so many organs in the performance of their functions; and farther, many individuals cannot bear the remedies which have been thought necessary for the subduction of the disease.

Some cases of fever commence with shivering, quickly followed by increase of heat and other symptoms of pyrexia, and terminate in a few hours, after considerable suffering, by copious perspiration; this is the simplest form of fever, and is termed "*Ephemeral;*" but when there is a regular succession of paroxysms, it is called "*Intermittent.*"

Other cases commence in the same manner, followed by heat of skin, &c.; continue for a day or two, when the symptoms decline; and there is sometimes a state of complete apyrexia, which continues only for a short time, when they recur with perhaps increased violence. This kind of fever has obtained the name of "*Remittent.*" When it occurs in infancy and childhood, it is called "*Infantile Remittent.*" When the skin becomes yellow, the term "*Yellow Fever*" has been applied.

Another kind of fever continues for days, or weeks, without intermission, and is therefore called "*Continued Fever.*" It has several varieties, of which the following are brief sketches.

First variety.—An individual feels impaired appetite; his bowels out of order; his urine scanty and high coloured; he

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traces of disease can be investigated with due care and deliberation, are public hospitals, and the indifference which generally prevails is shameful. If a physician has the ability, he is too much occupied, and some, unfortunately for science, have neither the ability nor inclination.

passes restless nights, and at length is sensible of increased heat of skin; towards morning he generally falls into a gentle perspiration, and enjoys a few hours sleep, from which he rises somewhat refreshed; he finds his tongue loaded, his breath more or less fetid; he feels unwell, but still is able to pursue his ordinary affairs. In the course of the day he is sensible of frequent slight chills, and flushes of heat; he becomes rather languid, has a little headache, but hopes to be better after dinner; he returns home, and although he has no appetite, forces himself to eat and drink, and passes rather a worse night. This goes on for several days, till at last he shivers pretty severely, and feels so much oppressed that he is compelled to confine himself to bed. Then for the first time medical advice is sought: the physician can find no symptom which can be attributed to inflammation; there is considerable restlessness, but no great degree of suffering, except that which proceeds from a sense of oppression in the præcordial region, fulness in the stomach and bowels, and pain in the loins; the appetite is gone, and the individual loathes food of all kinds, but has considerable thirst. The mental faculties are commonly quite sound, but there is perhaps slight alienation during the night.

Abstinence from solid food, and a steady perseverance in gentle laxative medicines, soon produce an amendment. This is the form which I have denominated "Fever from functional derangement."

Second variety.—A person is sometimes seized with a shivering more or less severe, followed by severe pain in the head, chest, or abdomen; accompanied by considerable heat, thirst, full pulse, and every symptom which announces a subacute attack of inflammation of some structure, within one or other of the three great cavities; and this is the form all writers term a pure inflammatory fever. But when the inflammation of any part runs high, it is then said to be an inflammation of a particular tissue or organ. It must be recollected, however, that inflammation of internal organs may go on to a fatal termination without strongly marked symptoms.

Third variety.—Another individual, without being sensible

of any previous complaint, may be suddenly seized with shivering; the sense of coldness soon becomes intolerable; he is unable to support himself in a standing or even in a sitting posture; his intellectual faculties are soon observed to be impaired, his features shrink, a deadly coldness gradually spreads over the whole surface of the body, his pulse sinks, he makes little complaint, and dies without the appearance of any of the symptoms usually termed febrile. This is a form of disease which is certainly not very frequently met with in this country, but which is often seen in warm climates, and it occasionally attacks women in child-bed. This is the purest example which can be given of what has been termed congestive fever,* but it is not that form of it which we most frequently meet with in these latitudes, where it generally developes itself in the following manner:—A person, after feeling more or less unwell for some days, or perhaps for some weeks, experiences chilly sensations, alternating with unusual warmth; he is disposed to sit over the fire; feels weak, and after being in this situation for some time longer with changes from heat to cold, the cold predominates to his sensation, while another person will pronounce him to be hot; but upon careful examination, his extremities, more particularly the hands and feet, will be found cold; he makes little complaint, and is often thought to be asleep, when in fact he is comatose. Occasionally, however, the head is quite free, he suffers from slight dyspnœa, is unable to take a full inspiration, but has no pain. The tongue is generally moist, sometimes loaded, white and shrunk. The pulse is soft, sometimes quick, at others not above the natural standard. Even when to all appearance he is in a complete state of coma, he can be roused, when his expression of countenance will be vacant, and appear as if he were in a state of intoxication. If questioned as to what he complains of, he will answer, "of nothing," or he will move his hand towards his head, or place it on his breast signifying some uneasiness, but he quickly falls into a comatose state again.

* This is the form of fever which occurs in Rome and other places where Intermittents prevail, and is termed *fièvres intermittentes pernicieuses*, the pathological elucidation of which has been so fully pointed out by M. Bailly.

Fourth variety.—The next form of fever of which it is my duty to give a sketch, is that in which the patient is seized much in the same way as in the last described variety. He complains, however, from the first, of pain in his head, chest or abdomen; has frequent attacks of chilliness followed by heat; with symptoms characteristic of diseased action in the head, thorax, or abdomen. But this state is quickly succeeded by more or less insensibility, slight delirium, rapid weak pulse; the surface of the trunk of the body feels hot, while the extremities are rather cold; the delirium which manifested itself only during the night, now becomes permanent; it is not of the furious kind, but that which is appropriately termed "low muttering delirium;" the tongue, which was moist for the first few days, is now observed to be dry and glazed, and tremulous; he passes his urine and fæces in bed; is always found upon his back, and however often he may be moved, will soon shrink down again towards the foot of the bed, which is a sign of complete prostration of strength, and perfect helplessness,—a bad symptom in any disease. In this state it is impossible to rouse the patient, and it may be evident that he is also blind; the pulse being quick, and so weak as scarcely to be felt, while the action of the heart may yet be very strong, and a considerable pulsation felt in the carotids or abdominal aorta. Recovery is rare when the symptoms are so very severe, although the fatal period may be protracted to the end of the third week. Occasionally in this form of disease, instead of the cold predominating, there is considerable heat, and the symptoms are pretty sharp, but at the termination of a few days, they become such as have been described above. This is the disease generally called "*Typhus.*" But when the symptoms run very high at first, and subsequently become low, then it is usually called "*Synochus.*" And this is precisely the form of disease which will be more particularly described hereafter, under the denomination of "*a mixed form of fever,*" from the want of a better appellation. The term Typhus is objectionable, because it is sometimes used to denote a malignant, or a putrid fever; at others it is employed to signify a nervous fever. The term Synochus is also objectionable, for this reason, that it is stated to be of an inflam-

matory nature, but there is a supposed union with a typhoid state of the system, which, although present, remains latent in the first stages, and subsequently developes itself; and we are told that the appropriate remedies for inflammation are not to be employed, from a dread of typhus, which must inevitably follow.

The term Hectic fever, is used only to signify febrile symptoms consequent to some previous disease, and restricted to symptoms which are produced by the formation of pus in some organ or tissue; in fact, whatever doubts have been entertained with respect to the nature of all other fevers, this is almost the only one which is universally allowed to be symptomatic.

It is considered unnecessary to offer any general explanation in this part of the work respecting the fifth class, viz. Fevers attended with eruptions; or the sixth, the Plague.

Causes of Fever.

The causes of fever are marsh miasm, contagion from human effluvia, and epidemic influence. These causes, together with cold, fear, &c. are called in medical language remote; but I shall continue to employ the terms common and specific. Cullen resolves all remote causes into sedative, in order to support his dogma of debility; he could not consistently allow a cause of a stimulating and exciting nature. Marsh miasm, he supposes capable of producing intermittents and remittents only, and he restricts the term contagion to human effluvia, capable of producing continued fevers only. He considers the common causes scarcely capable of producing fevers. Some authors assert that there is only one species of infectious matter peculiar to all febrile diseases.

No one who has attended to this subject, can deny the influence of contagion, and the air of marshes, on the human body; but I conceive that too much has been hitherto attributed to them, too little to the previous state of the constitution, and also by far too little to the common causes of fever, and to internal irritations. A weighty argument in favour of contagion, is sometimes drawn from the well known fact, of fevers spreading not only from one to another in a family, but also in the same

neighbourhood; but the similar circumstances under which the inhabitants are placed should not be forgotten. The anxieties, the hopes and fears, which alternately affect individuals attending others whom they love, the exposure to cold and fatigue, the night-watching and want of rest, the irregularity in taking nourishment, and the neglected state of the bowels, all tending to produce loss of balance in the circulation, and local disease, will go far to account for a number of individuals in the same neighbourhood, and more particularly in the same family, being affected one after another. Neither should it be forgotten, that all these individuals residing in the same locality, and living in a similar manner, may have been exposed at the same period with the person first affected, to the miasm or epidemic influence, or some of the common causes which produce fever. Why one individual should be sooner attacked than another, and have the disease perhaps more severely, it is difficult to determine. An interesting question here arises,—What length of time does the contagion remain latent in the body, before it shows its effects? This is an intricate question, and one which has never been satisfactorily investigated. Some say it can be for a few days or weeks only, while others state with great confidence, that it may remain many months. Dr Gregory used to assert, that contagion might lie frozen for any length of time, and resume its virulence upon being thawed. There are other interesting facts, which are not sufficiently attended to in considering this subject. It is my belief, that contagion will not produce fever, applied a thousand times to a person, if he be in a good state of body and mind. Dr Gregory stated, that he must have been exposed to the influence of contagion some 20 or 30,000 times without affecting him once. The contagion of fever, to produce its effects, must be applied to a person ill fed and clothed, or to one whose stomach and bowels are out of order, or who is labouring under the effects of some mental depression.

From the evidence before us in the records of medicine, it appears that individuals residing in low marshy countries, are peculiarly liable to fever which has been termed intermittent. The air of a marsh, however, does not differ in its chemical properties from that of the most salubrious situations; it sup-

ports combustion, and therefore cannot, as some have supposed, be deprived of much of its oxigen. If its constitution were changed, it would affect all who breathed it, blacks as well as whites; but this is not the fact, for there are very many people, who live in the centre of marshes for years, without being attacked by intermittent fever. I have myself had many attacks of this disease during a residence in a marshy district, therefore it has been in my power to investigate this subject minutely, not only with regard to the phenomena of the disease and its causes, but also the sensations produced during the paroxysms. From personal observation thus acquired, the first circumstances which attracted my attention, were, that men were more liable to the disease than females,—whites than blacks,—the dissolute than sober steady-living men; and that agues were most prevalent at new and full moon.

Women are less liable to the disease than men, because they are less exposed to vicissitudes of weather, their habits are not so dissipated, and they keep more regular hours. Blacks born in the West Indies, are less liable to this disease than whites, partly, no doubt, from the nature of their constitutions, but principally because they have neither the means nor the liberty to indulge themselves like their masters. But I am convinced that difference of constitution, enabling blacks to resist the causes of fever better, has been very much overrated, and that diseases which destroy so many Europeans, are owing more to licentiousness than to the effects of climate. The dissolute are more liable to this disease than others, because they often expose themselves recklessly during the night, when the system is in a state of collapse; and the disturbance which is created and kept up in the functions of important organs, by constant excesses, must not be lost sight of.

Moisture alone has a great effect in producing disease, and its influence is speedily observed on the mind as well as the body. But moisture alone will not produce intermittent fever, the influence of excessive heat must be superadded, and then there is a rapid evaporation from the earth's surface. It is this evaporation, I imagine, which is productive of so much mischief to European constitutions in warm climates, particularly where there is any tendency to collapse. Agues are not

commonly prevalent during the rainy season, when the surface of the earth is more or less covered with water; but they become so after the dry season sets in, when it is alleged "the sun acts upon the soil itself, producing deep rents, whence it is supposed the miasm emanates." This, however, can be more satisfactorily accounted for in a different manner. During the rainy season, white people take greater care of themselves, and are less exposed; the sun is obscured from the eye by dense humid clouds; there is consequently a pretty constant deposition of moisture, but little or no evaporation. The sun's influence becomes very great when the rainy season ceases, and the extent to which evaporation goes on, exceeds all belief. It is then that severe fevers and dysenteries generally prevail.

Dr Fergusson has observed, that "the same rains which made a deep marshy country perfectly healthy, by deluging a well-cleared one, where there was any considerable depth of soil, speedily converted it, *under the drying process of a vertical sun, into a hot-bed of disease.*

With regard to the apparent influence of the planetary system in intermittents, it must be observed, that in localities where this disease generally prevails, the surface of the earth is scarcely above the level of the sea at high tides; so much so, that to prevent inundations, dykes are thrown up. At new and full moon the tides rise, the marshes become covered with water, the drains become charged, and the daily effects of evaporation produce the disease. I am indeed aware, that in the interior of Ceylon, and above the Ghauts in the peninsula of India, where the tides cannot have the slightest influence, agues are very prevalent, both among natives and Europeans at certain periods of the moon's age. I am informed by Mr Marshall,* that in the interior of Ceylon, he has seen the mercury in the thermometer rise from 60° to 90° in the shade: and in the sun's rays even to 142°. The difference of temperature to which the troops were exposed from 5 o'clock A.M. till mid-day, amounted sometimes to 82 degrees.

* The well-known author of Notes on the Medical Topography of Ceylon—Hints to Young Medical Officers, &c. &c.

Some have attempted to account for the occurrence of remittent fevers by the effects of excessive heat; but I believe that heat alone, unless the temperature be very high indeed, will not produce fever in any climate, till moisture be superadded, or sudden changes of weather take place, when the thermometer will suddenly fall twenty or thirty degrees, as I have myself observed in unhealthy seasons.

It will be seen that it is not my intention to deny the existence of some invisible substance suspended in or mixed with the air of the atmosphere, and which may produce intermittent fever.* A fact may be mentioned on this side of the question, which must carry considerable weight with it. It has occurred to me to see a good deal of intermittent fever in situations far remote from marshes, but in every one instance the individuals had been at some period of their lives in marshy districts; yet it is certainly very strange that some of them never had a paroxysm during the period of their residence in these places, and not till months, and in some instances years, had elapsed.

Some contagious diseases are communicated from person to person, by breathing the air in the apartment where the sick person is confined; others require that actual contact should take place; and some diseases are communicated in either way. In the plague, it would appear that actual contact with the affected individual, or with his apparel, is necessary; whereas, in small-pox, the contagion may be received merely by coming into the same room, and it is also conveyed by inoculation. Contagious diseases spread slowly from one person to another, and from house to house, and may often be concentrated within a circle, where it will attack all, or almost all, who are exposed to the contagion, particularly those who have not had the disease before.

When we say a disease is epidemic, it is understood that we mean one which is produced by a certain state or condition of the atmosphere at present unknown, and which has baffled the exertions of every one who has entered upon its investi-

* Some writers go the extraordinary length of speaking of the specific gravity of Marsh Miasm.

gation. The term implies that a great number of people are suddenly seized at the same period. An epidemic disease, after continuing for a longer or a shorter period, suddenly ceases, at a time perhaps when the greatest number of patients are affected. These are facts which appear to have confounded those who assert that yellow and other fevers are invariably contagious.

It does not appear that intermittent fever is ever contagious: but I am of opinion the yellow fever, and that which has been termed Typhus in this country, are so, under particular circumstances, and sometimes in a very high degree. Observation and experience have induced me to conclude, however, that this cause of fever has been very much overrated.

In the year 1793, Dr Chisholm made an attempt to prove, that the fever which then prevailed in the West Indies was highly contagious, and imported from Bulam, on the coast of Africa, by a ship called the Hankey. Similar attempts have since been made in many places in America, as well as in Europe, to account for the severe fevers which have prevailed from time to time. The favourers of importation have invariably failed in proving the disease to have originated in that manner, and have not been able to show that it had not a local origin. In the town and Garrison of Gibraltar, there are always cases of fever, particularly in sultry weather; many are severe, attended by yellowness of the surface of the body, and vomiting of a dark-coloured matter, commonly called Black Vomit. These cases are considered by all candid observers to be the ordinary remittent fever, common to this and other places under similar influences. The majority of the cases are found to occur in the lowest, worst ventilated, and filthiest parts of the locality. But in 1804–1810–1813–1814, and 1828, Gibraltar was visited by a fever more severe in its symptoms, more fatal in its results, and attacking a larger proportion of the troops, as well as the inhabitants. On each of these occasions attempts were made to prove its importation, and that it afterwards spread by contagion, and had no trace of local origin. Considerable doubts were, however, entertained upon this subject; but in 1814, the supporters of importation and contagion failed so completely in shewing the

foreign origin of the fever which then prevailed, that many sensible people were led to doubt, and others to deny, the truth of such views. I wish at present to confine my observations to the source of the fever which prevailed in the town and garrison of Gibraltar in 1828.

A host of medical men, with the late lamented Dr Hennen at their head, maintain that the disease was of local origin, for which there were abundant sources, and that there is no proof of its having been imported.

One or two others, with Sir William Pym, Superintendant-General of Quarantine, as their leader, not only insist that it was not of local origin, but that it was imported in a particular ship called the Dygden, which sailed from Havannah on the 12th May 1828, and arrived at Gibraltar on the 28th June.

I have carefully perused all the evidence produced through the medium of the Medical periodical press, and published by the following gentlemen :—Mr Fraser, late Surgeon to the Civil Hospital at Gibraltar; Dr Smyth, Surgeon 23d Regiment; Mr Amiel, Surgeon 12th Regiment; Mr Wilson, late of the Medical Staff, who I believe retired from the service, partly from disgust, and partly from the persecution to which he was subjected, and would not submit ; Dr Barry, Physician to the Forces : Also, Sir William Pym's replies to queries put to him by the Royal Medico-Chirurgical Society of Cadiz, —together with the opinions of the Board of Commissioners, and certain documentary evidence respecting the annual occurrence of fevers of a similar character at Gibraltar, as extracted from the books of the Civil Hospital, and authenticated by the signatures of a number of highly respectable gentlemen.

After the most careful perusal of these productions, duly considering all the facts adduced in evidence by all parties, my deliberate opinions are as follow :

1*st*, That the fever of 1828 was of local origin, and for which there were unfortunately abundant sources in the bad state of the drains, the crowded condition of the poorer inhabitants, and the exceedingly filthy and badly ventilated state of their abodes.

2*d*, That there is not a tittle of evidence to show that the

disease was first propagated by communication with the Swedish ship Dygden. Indeed, it does not appear that there was any cause to suspect this ship of bringing the seeds of the disease from Havannah. In the first place, we see from her clean bill of health, signed by the authorities there, that "this city and its neighbouring towns are free from all plague or contagious epidemic disease; as likewise the said Captain, with the fifteen men of his crew, are in a perfect state of health, according to the muster by his roll," &c. In the second place, we find the declaration of the Captain, and the report of Dr Hennen to the Governor, the first of which bears that he "sailed from Havannah on 12th May, with a crew of fifteen men, all in good health. A few days after, two men of the Swedish part of the crew complained of severe headache, and pains in the limbs, which increasing, they had to go to bed. Through sudorifics and purging medicine, they *got well in eight days*, so as to be able to attend their duties. During that time, five others had been taken ill of the same complaint, *but recovered in a few days*, under similar treatment. A lapse of ten or twelve days followed, during which the whole crew were in perfect health; but upon getting into a higher latitude, I met with gales and rain, when the greater part of the crew suffered much from wet, and immediately after, those who had till then been well, were taken ill, probably from cold produced by the weather, yet the symptoms which appeared were the same as in the others. The youngest recovered in a short time, but the eldest two died, one after five, the other four days illness, which took place on the 27th May, and 1st of June. The old clothes they had worn, together with hammocks, and what was in them, were thrown into the sea with their bodies."

In Dr Hennen's report to the Governor of Gibraltar, dated 2d August 1828, we find it stated, that he had minutely inspected the Captain and crew, "whom I found in perfect health, and I shall repeat my inspection before the expiration of their quarantine, on the 6th of the present month. In my letter of the 29th July, I mentioned, as the reason for putting the ship in quarantine for forty days, that two men died on the passage. It is now sixty-six clear days since the first

man died, and sixty-one since the death of the last, *and nothing like disease* has since appeared, nor have I the most distant reason to apprehend danger to the public health, from any circumstance connected with the Dygden."

3*d*, If the disease were contagious, it does not appear from the evidence to have been so in any high degree.

4*th*, It is an undoubted fact, known to every medical man who has been upon the rock, that remittent fever, attended by yellowness of skin and black vomit, is a very frequent occurrence during the autumnal months. I am in possession of an authentic document, containing a history of the symptoms and appearances on dissection, observed in cases of remittent fever treated in the Civil Hospital at Gibraltar in 1821, and the five subsequent years. Having compared these with the cases of 1828, I can discover nothing different. The two symptoms pitched upon by Sir William Pym, as pathognomonic of true yellow fever, viz. yellowness of the surface and black vomit, were present, and the morbid appearances found after death were perfectly similar.

The superior medical officers have had a heavy charge made against them in the following statement by Dr Smith. "At one period of medical rule in this garrison, every variety of fever *was ordered to be returned under one head.* Such, indeed, was the thraldom of the military medical press (if I may so use the expression,) at Gibraltar, from the termination of the epidemic fever of 1814, until the arrival of Dr Hennen in 1826, that it was considered a most wicked heresy for a surgeon of a corps to return fevers under any other head than *simple continued fever.* The consequence is, that although febrile diseases are the most frequent of the numerous cases treated both in the Military and Civil Hospitals, no correct table of fevers can be now formed from the returns of these establishments; no distinction whatever being drawn between the different species of remittent and continued. The authors of such a measure can best answer for themselves." Was this done to deceive the Governor, or did it receive his approbation to mislead the authorities in England? This calls aloud for serious investigation, in order to prevent the repetition of such disgraceful management. That it could have

been endured, can scarcely be believed, except by those who have been exposed to the tyrannical conduct of ignorant and obstinate medical superiors.

5th, That Sir William Pym's answers to the queries of the Spanish physicians, are highly discreditable to him as a scientific man, and calculated to injure the public interests, however much they might be intended *to fix him in the receipt of the salary derived from his sinecure office of Superintendant-General of Quarantine in Great Britain.* These answers are for the most part vague assumptions—some being drawn from insufficient evidence—others from no evidence whatever —while many of them are at complete variance with fact, of which last, the following is a notable example:—Answer to Question 3d. "The first cases were, as I have said, in a house of 24 district, *the situation of which is healthy, very well ventilated*, and 200 feet above the level of the sea." Now it was in this district of the town that the fever avowedly first appeared, and was for some time confined. Whether it was such a healthy, well-ventilated spot, or one, the air of which was saturated with febrific poison, the reader is left to draw his own conclusions after the perusal of the following statement, copied from a document which I received from Gibraltar. It was not written to contradict Sir William Pym's answer, as it never entered the writer's imagination that the Superintendant-General of Quarantine, or any other gentleman who had resided at Gibraltar, could have hazarded such an erroneous statement.

The district in question (No. 24.) "is situated in a natural gorge of the mountain, and is rendered still more close by a high wall raised for the military protection of the town. The wall is called 'Charles the 5th wall,' and is situated on the south of the town. The rear of the district, (24) together with the whole town, is impenetrably shut out from the influence of east winds by the rock itself. The district itself is particularly cut off from the beneficial effects of perflation by a high and impending semi-circular bluff of the mountain, in some degree insulating it from the rest of the town, on the north side. Charles the 5th wall is higher than the tops of the buildings in this district. This locality is therefore excluded

from the influence of every direct wind, unless that which blows from the west, which was not the case when the fever broke out. Besides, it is deserving of particular attention, that the superficial soil was filthy, that the district is intersected with numerous collateral drains, and gives origin to several others which unite on the level below, and these form one main sewer which disgorges itself into the sea at water mark, directly in front of this part of the town. The wind enters the mouth of this sewer on the beach, rushes upwards through the drains, and escapes through gratings (which are closely concentrated in this district) loaded with offensive and noxious exhalations, and diffused within a limited circle among the houses erected round the mouths of the great branches. There is also a deep and large common soil-pit in this district, which at the commencement of the epidemic was filled with impurities of every kind. In this situation a drain burst about the beginning of September, in the barrack-yard of the 12th regiment, and when I saw it, its contents had broke up the solid pavement, and was boiling over. The atmosphere of this part of the town was consequently noxious, and contained within itself a sufficiency of putrid matter to have disseminated a febrific miasm over the whole garrison. Now, it is a remarkable fact, that the two first cases of the fever originated on the ground floor of a badly ventilated house in this district, and in the close neighbourhood of one of the openings of the drains; and about 50 of the cases in the beginning of the epidemic were distinctly traced by several medical officers to come from the vicinity of the openings of the drains and privies of this district, or in the course of the drains."

We find the following statements made by Dr Hennen, in his official communications, which I have copied from Dr Smith's paper: "That so many cases of a fever of a very serious nature have appeared in the barrack of the Sappers and Miners, on Hargrave's parade, which I would observe to your Excellency is in the line of the drains, crossing from district No. 24, that I feel myself called upon to submit the propriety of immediately encamping that corps, and totally evacuating the barracks." In another letter to the Governor, Dr Hennen further stated: "In reference to my letter of this day's date,

I have minutely inspected district No. 24, in company with Mr Wilson of the civil hospital, Mr Woods, the medical officer attached to that district, and other staff-officers; and it is with much regret that I have to state to your Excellency, that at every step I took in that district, I had reason for surprise, not that fever had broken out there, but that it had not extended farther. From whatever causes it may have proceeded, the pauper population is dense to a degree incredible, except to those who have seen it. In sheds without ventilation, without drainage, and generally composed of the slightest materials; *in tiers of beds as close* as in a crowded transport, numerous individuals sleep. They go out to their work at an early hour, and return at gun-fire, locking up their miserable places of nocturnal shelter during the day, and leaving them saturated with the steam of their bedding, their food, and the overflowing receptacles of their ordure. The detail would be too disgusting to enter into; but I most respectfully submit to your Excellency, the indispensable necessity of sweeping away the whole of these sheds, which I have every reason to suppose are unauthorised by the government." A commission was subsequently appointed by the Governor's orders, to inspect the different districts of the town, which was composed of military as well as medical officers, and I copy the following statement from their report: "In the course of our inspection, we were struck at every step we took, with the density of the population." So much for Sir William Pym's Answer to the 3d Question, in which he has given a confident assurance of the healthy situation and well-ventilated state of No. 24. district, where the first cases of fever occurred in 1828. Both statements cannot be true, and I am sorry to say there are many other points in the same predicament. I wish it were possible for me to reconcile them with each other, not only on account of the reputation of Sir William Pym, as an old officer, but for the credit of the department to which he belongs, and the judgment of the authorities who appointed him to the lucrative situation of Superintendant-General of Quarantine in Great Britain.

6th, It is my opinion that the Board of Commission was not happily chosen by Sir George Murray. No medical officer

should have been nominated, or any other individual, however exalted his rank, who had previously expressed decided opinions on the subject to be investigated.

7th, I humbly conceive Sir George Don, the Governor, acted contrary to his orders, and certainly he did not act wisely, by delegating his authority as President of the Commission, to any individual, and more particularly to Sir William Pym, *the Superintendant-General of Quarantine*, who immediately nominated his newly-acquired partizan, Dr Barry, to be Secretary to the Commission. That Dr Barry is an ingenious gentleman is well known; that he changed his opinions very suddenly at the time of Dr Hennen's death is alleged, and has not been satisfactorily disproved; and that he immediately adopted the opinions of his new chief is undoubted. Whether Dr Barry, in his capacity of Secretary, gave colouring to the evidence produced before the Commission, or improperly put leading questions to the parties examined, to favour the views of his chief, is best known to those who were present at the investigations. But it will be admitted, that such functionaries as President and Secretary should not have been chosen from a class of persons to whom the slightest suspicion could be attached. On the list of the Commission, I find another name as exceptionable as those of Sir William Pym and Dr Barry, viz. that of Dr Broadfoot, *Superintendant of Quarantine* at Gibraltar. Besides these, there are also the names of two official gentlemen, the Captain of the Port, and the Town Major, who were thus also improperly placed in a situation either to accumulate or reject evidence, which might shew inattention or dereliction of duty to such an extent as to compromise their situations! The only unexceptionable appointments on the Commission were those of Colonel Chapman, Civil Secretary, and Judge-Advocate Howell, and the coincidence of their opinions is quite remarkable.

Colonel Chapman's opinion is as follows:—"Judging from the evidence produced before the Board, the manner in which it has been given, together with the description of persons who have been brought forward as witnesses, I am decidedly of opinion, that the late epidemic disease is of local origin. As to the importation of the late epidemic, I am of opinion,

that the attempt to prove the introduction of the disease, after many months of fruitless inquiry by those who wish to prove it, has totally failed."

Judge-Advocate Howell gave the following opinion:— "Upon a careful review of all the proceedings before the Board, I am of opinion, that the evidence brought forward has totally failed to prove that the late epidemic disease was introduced from any foreign source, either by the ship Dygden, or by any other means; and I am farther of opinion, that the late epidemic had its origin in Gibraltar."

From Botta's History of Tuscany, the following statements are extracted respecting the epidemic yellow fever which prevailed in Leghorn in 1804. "It was occasioned, as it appears, by the prevalence, during the summer of that year, of south winds, unusually warm and rainy; this sickness was by some termed the Yellow Fever, by others the Black Vomit; both names which agree well with the symptoms which mark it. *It began to rage in the lowest quarters of the city, and those most crowded and filthy,* to such a degree that some were cut off in seven days, some in five, others in three, and even in the short space of one day." "The disease was most violent in robust young men, more mild with the weak, the old, and with females; but almost all those last, attacked when pregnant, died; almost all the children escaped." Speaking of the remedies, it is remarked, "On the other hand, it was found, that from the air being impregnated with animal exhalations, the disease was more easily propagated, and the person infected was more violently attacked; and a confirmation of the argument was found in the circumstance, that the quarters of the city most filled with filth, and the houses of the poor, were the chief seats of the disease. On the contrary, the airy quarters, and where the houses were neat and clean, and enjoyed open and free air, were either exempted, or did not become worse, or the infection did not spread from one body to another." "It did not extend into the country, although persons in numbers, and goods in quantities, were transported and spread from district to district, and from the city to the country." On this occasion, also, an attempt was made to prove the importation of the fever from Vera Cruz, but was not successful.

When the yellow fever prevailed in Philadelphia in 1794, the celebrated Dr Rush was most shamefully persecuted by the authorities, to whom many of his medical brethren unhandsomely lent themselves, for having proved that the yellow fever existed in that city—that it was generated in the place, and had not a foreign origin. It is now more than forty years ago; and after reading the report made on the subject by his opponents, I can readily join Dr Rush in his conclusion, that "it is impossible to review this report, without blushing for the shameful submission made by the Science of Medicine, to the commercial spirit of the city."

It may be useful to my readers to know the evidence which Dr Rush produced to shew the local origin of the fever, and it will be observed that an attempt was made on this occasion to fix its importation on a ship. "It was produced," says Dr Rush, "by the exhalations from the gutters, and the stagnant ponds of water in the neighbourhood of the city. Where there was most exhalation, there were most persons affected by the fever. Hence the poor people, who generally live in the neighbourhood of the ponds in the suburbs, were the greatest sufferers by it. Four persons had the fever in Spruce Street, between Fourth and Fifth Streets, in which part of the city the smell from the gutters was extremely offensive every evening. In Walter Street, between Market and Walnut Streets, many persons had the fever: now the filth of that confined part of the city is well known to every citizen. On the 25th August, the brig Commerce arrived in the river from St Mark. After lying five days at the Fort, she came up to the city. A boy who had been shut out of his lodgings, went in a state of intoxication and slept on her deck, exposed to the night air, in consequence of which the fever was excited in him. This event gave occasion for a few days to a report that the disease was imported; and several physicians, who had neglected to attend to all the circumstances that had been stated, admitted the yellow fever to be in the town. An investigation of this supposed origin of the disease soon discovered that it had no foundation."

Vitiated air,* and the effluvia which proceeds from the bodies of individuals crowded together in jails, hospitals, and ships, have always been abundant sources of fever. Dr Fordyce mentions instances where sheep and hogs were transported, during the American war, from England to America, in the holds of ships, in which many were confined in a small space: an infectious fever frequently broke out among them, which destroyed great numbers.

History affords many melancholy examples of the baneful effects of vitiated air and human effluvia, and the speed with which they destroy animal life. The best example is to be found in the occurrence which took place last century in the black hole at Calcutta. One hundred and forty-six unhappy individuals were forced into a dungeon, about eighteen feet square, at eight o'clock at night, and at six next morning, when released, only twenty-three came out alive; *most of these were in a high putrid fever, and subsequently died.*

It becomes an interesting question, but one too extensive for this work, how contagion propagates itself, and to which part of the body it is first applied? In this inquiry, we shall be much assisted by the circumstances which are observed to take place after inoculation with small-pox. The mucous membrane of the lungs seems to be one of the first parts in which the diseased action is to be detected; and careful observation has induced me almost to believe, that in diseases produced by contagion, the bronchial membrane rarely if ever escapes.

Fourcrois tells us, that in several of the burial-grounds in France, in which the graves were dug up sooner than they ought to have been, the persons employed have occasionally been asphyxiated; those who were standing at a little distance, were often affected with vertigo, fainting, nausea, loss of appetite, &c. History affords us remarkable instances of the occurrence of diseases decidedly epidemic: the most ancient are those which will be found in sacred writ, in which we find, that on one occasion seventy thousand persons were

* It is to be regretted, that the term *Malaria* is not restricted to foul air, according to its literal meaning.

destroyed by pestilence in three days' time ; and we are told, also, that one hundred and eighty-five thousand persons were destroyed in the Assyrian camp in a single night. The most remarkable epidemic of modern times, is the Cholera of the East, which extended itself in the very teeth of tempestuous winds.

Pythagoras first started an opinion respecting critical days, and he had an unlimited belief in the occult powers of certain numbers. Hippocrates seems to have entertained similar opinions : and it is an essential part of the old doctrines of concoction, according to which it was supposed that a separation of the morbific matter had a tendency to take place on one of the critical days, by a discharge from the skin, bowels, kidneys, or blood-vessels.

I have no belief in the influence of critical days, although I admit that the crisis frequently takes place in some of the ways mentioned. When an organ is affected with disease, there is a constant effort of nature to throw it off : this effort is, in truth, one of the great principles of life, and its object is effected by a determination of blood to another organ : occasionally a spontaneous discharge of blood takes place.

From the time of Hippocrates, it has been generally believed that fevers have a tendency to remit on the 3d, 5th, 7th, 9th, 11th, 14th, 17th, 20th days, and even the 21st. Many modern physicians have adopted this doctrine; but I doubt much whether it has not proved more injurious than beneficial in the treatment of disease. Often may physicians be seen prescribing a placebo, because the critical day is at hand, when they ought to be actively employed in eradicating the disease. When attending to this point, I have very often found the calculations made erroneously ; and not unfrequently I have seen physicians disagree as to which was the proper critical day—one calculating from the period when the rigor took place—another from the period when the heat of skin occurred—and I have seen a third calculation made from the time when the patient confined himself to bed. There can be little doubt, that fevers and other diseases have a tendency to run through a regular course, and when they terminate favourably, this happy event generally takes place upon the occurrence of

an eruption, or of some discharge, as by diarrhœa, copious perspiration, flow of urine, expectoration, &c. It cannot be denied, however, that in some diseases there is a strong tendency to periodicity, but far more so in the accession than termination. Thus, in intermittent fever, the attack may come on regularly at the usual period, but each stage may occupy a shorter or a longer space of time in one paroxysm than another. Sometimes an individual dies in the cold fit, but much oftener the hot fit is not relieved by sweating, and his disease becomes a continued or remittent fever, or inflammation of a particular organ takes place. But it is of little importance whether the doctrine of critical days be true or false, if the physician acts wisely, and neglects nothing which can tend to reduce the diseased action.

INTERMITTENT FEVER.

Of all the febrile diseases, intermittent is generally the simplest in form. It is composed of three stages, beginning with a cold fit, followed by heat, and terminating in profuse perspiration. It has been known from the earliest ages, and is most prevalent in some parts of North and South America; the Pontine marshes near Rome; in Holland; and in the fens of Lincolnshire and Cambridgeshire in England. We are told, that in the sixteenth century, this fever was very prevalent, and proved fatal to a great number of people in London; and in the year 1558 it raged like the plague, and was also very fatal; but it has become less frequent in Great Britain, which is to be ascribed to the increased comforts of the people, to their habits of cleanliness, and to the improvement which has taken place in the climate, owing to the draining of lands, and cultivation of the soil. It has been stated, but, I believe, without foundation, that a miasm producing intermittent fever is generated in London, in the neighbourhood of St James's Park. Intermittent fever is of very frequent occurrence in all warm countries, and is one of the purest specimens of a disease depending upon an irregular determination of

blood, in which the system is often relieved by the unaided powers of the constitution.

Cullen's definition is, "Fevers arising from marsh miasmata, consisting of many paroxysms, with intermission, or at least with evident remission intervening, returning with remarkable exacerbation, and in general with shivering; one paroxysm only in a day."

Like most symptomatical definitions, this is very exceptionable. Paroxysms of intermittent have taken place from sudden change of atmosphere in situations where no miasm ever existed; and the most severe cold stage which ever came under my notice, and which lasted twenty-six hours, was produced by exposure to frost after the individual had got wet on the top of a coach. Mr John Hunter informs us, that two children had ague from worms; they took bark, but it did them no good; but the worms were destroyed, and they got well. We have in like manner, says he, agues from many diseases of particular parts, more especially of the liver and spleen, and from an induration of the mesenteric glands. Many instances are also recorded from repelled eruptions, the drying up of old discharges, as well as from the application of cold.

Sir George Baker has given an account, in the Medical Transactions, of an Intermittent that prevailed in 1780; it affected the inhabitants who lived in the higher parts of the country, while those in the marshes escaped. Sir Gilbert Blane informs us, that while the village of Greenhythe, nearly on a level with the marsh at Northfleet, is unaffected with Intermittent fever, the adjacent hills suffer considerably from it.

There are usually reckoned three kinds of Intermittents, the Tertian, the Quotidian, and the Quartan. But they ought strictly to be regarded as the same disease, with a longer or a shorter interval; and the one frequently runs into the other. We often, however, see a double Quotidian. I have observed, that the longer the interval, the more severe is the paroxysm, and *vice versâ;* but there are many exceptions. TERTIAN, is employed to express that form of disease in which there is an interval of *forty-eight hours* from the commencement of one

attack to that of another; QUOTIDIAN, *twenty-four;* and the QUARTAN, *seventy-two.*

Phenomena of Intermittents.

When an individual has once had an attack of Intermittent fever, he is afterwards more liable to the disease, and is sensible of its approach some time before any one suspects him to be ill; the toes and the last joints of the fingers feel cold and benumbed, and the nails have a blueish colour; he has sensations of languor, and long fits of yawning; occasionally at this period there is headache, sometimes stupor, and pains in the back and loins.

Cold Stage.—When the paroxysm actually commences, the patient feels the extremities cold, with a sensation as if a small stream of very cold water were flowing down the spine, which extends itself to the thorax and abdomen. He has great desire for warm drink, and to cover himself with as many bedclothes as can be procured; the prostration of muscular power is considerable; the sense of cold very soon becomes insupportable; the teeth chatter, and there is a universal tremor over the body; and if I can trust my own sensations, and the accounts of others, the tremors affect internal as well as external parts. These tremors sometimes terminate in convulsions. The respiration is always laborious, short, and hurried, and the individual is unable to take in a deep inspiration when desired; a short hard cough frequently attends, without expectoration; there is great oppression at the præcordia. Some individuals complain most of headache, some of pain in the back, in the lumbar region and lower extremities, and others of universal pain. In almost all cases the patient is incapable of attending to any thing. Sometimes there is stupor, and at others, coma or delirium. The features are much shrunk and pale; the eye looks dull and hollow, while the cheeks and lips are more or less of a livid hue. The pulse is oppressed and weak, sometimes slow, at others quick, and frequently intermits; but the violence of the tremors renders it often impossible to feel the pulse distinctly. The tongue is moist. It is a curious circumstance, that while the patient complains of intense cold, the heat of the body every where,

except in the extremities, is sometimes above the natural standard.

The paroxysm occasionally comes on without any rigor, instead of which the patient feels a slight sensation of cold, or severe headache, is lethargic, or affected with languor and yawning. Sometimes the paroxysm is announced by violent articular, lumbar, and frontal pains; and sometimes a patient falls into a profound sleep for several hours, and awakes in a violent hot stage. These various forms are called by the vulgar the dumb-ague. It sometimes happens, that at the next attack, instead of a regular paroxysm, a violent pain is felt in the situation of the supra-orbitary foramen, and extends to the brow, affecting the nervous twigs of the frontal branch of the fifth pair; this pain often continues for many hours, and seems to resemble the Tic Douloureux. But it would be vain to attempt a description of all the appearances which this disease occasionally assumes.

The duration of the cold stage is very various, rarely less than half an hour, and seldom exceeding four. It sometimes happens that an icy coldness steals over the whole surface, and in aguish countries it is not an uncommon circumstance for persons to die in the cold stage.

Hot Stage.—After the cold stage has continued for a longer or shorter period, the hot stage commences; the one gradually runs into the other, there being no distinct interval between them. The change is attributed by patients themselves to the treatment which has been employed, or to the effects of vomiting, which sometimes accompanies the cold stage. The skin becomes hot and dry, sometimes pungent; the face flushed and swollen; the thirst urgent, the tongue parched; there are restlessness, general uneasiness, and oppression at the præcordia; the respiration is hurried and anxious; and almost invariably, the patient complains of acute pain in some region of the body, generally in the head and lumbar region, very often also in the thorax, and left hypochondrium; there is frequently a slight degree of disturbance in the mental faculties, sometimes indeed delirium. On some occasions there are symptoms which announce cerebral disturbance, viz. severe headache, tinnitus aurium, and throbbing of the carotids, &c.

The pulse is frequently quick, sharp, and bounding, even in patients whose health and strength are already much impaired.

I have seen the thermometer, the accuracy of which had been well ascertained, rise in the hot fit, even in this country, to 110°, and in warm climates it is stated to rise as high as 112°.

The duration of this stage varies more than the former; in general it continues from four to twelve hours, and terminates in perspiration: but on some occasions the febrile symptoms continue for several days or weeks, when the disease is termed a continued fever; now and then there are marked remissions followed by exacerbations, when it is called a remittent: in addition to the last-mentioned circumstances, there are sometimes considerable irritability of stomach, black vomiting, and a yellow tinge of the skin, then the case is termed a bilious remittent, or yellow fever.

Sweating Stage.—After the hot stage has existed for some time, it terminates in the sweating stage; the perspiration appearing first on the forehead, arms, and legs, soon becoming general and profuse. It is difficult to calculate the quantity of this excretion in any case; but it is admitted by all who have attended to the phenomena of intermittents, to be very great. From the moment the perspiration begins to appear, the uneasy sensations, and other symptoms above described, begin to subside, and generally vanish after it becomes copious.*

Many patients fall into a profound sleep for several hours, and then awake quite refreshed; others complain much of weakness, while some whose constitutions have not been previously injured, are able to resume their ordinary duties almost immediately.

When this disease continues for some time, the patient not only becomes weak, and loses flesh, but he has no interval of

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* M. Andral, in the first part of his very excellent pathological writings, p. 477, mentions a very curious case. A young man, who had been hemiplegic on the left side of his body from his infancy, was attacked with tertian intermittent. He only perspired on that half of his body which had not been paralysed. He stated that in his best health he never perspired but on one arm and leg, and one side of his face and neck.

ease; each paroxysm increases his sufferings, and he feels comparatively little relief from the perspirations, which he often prolongs, in the vain hope of alleviating his symptoms. He complains of headache, intolerance of light and sound; or he has a cough and dyspnœa, which will almost always be found to depend on inflammation of the lining membrane of the air passages; or he has constant thirst, flatulent distension of abdomen, constipation, or diarrhœa, with griping pains in the bowels, a dull pain and sense of weight in both hypochondriac regions, more particularly in the right. The skin continues hot, and feels harsh; the feet and legs frequently become œdematous; the abdomen permanently tumid; the urine scanty; the tongue dry at the tip, the rest of it being furred; the patient passes restless nights; and perhaps in the very next paroxysm he may die in the cold stage; or the sweating stage may not succeed the hot, and he may die in a few days of continued or remittent fever; or decided marks of inflammation of the brain, liver, lungs, &c. take place, and he is cut off, from the effects of disorganization in these organs. Such circumstances are of frequent occurrence in warm countries, where intermittents prevail; many such melancholy examples will be found, by referring to the works of Sir John Pringle and others; but more particularly to Sir James Fellowes's reports of the destruction occasioned by this fever among our troops employed in the expedition to Walcheren. The history of the fever which annually prevails at Rome, and which has been so ably and faithfully described by M. Bailly, also corroborates the above statements.

This fever sometimes attacks individuals when labouring under internal diseases, such as dysentery, hepatitis, &c., and I have frequently seen a remittent converted into an intermittent. It may also be mentioned, that enlargements of the parotid take place during the course of intermittents. The gland increases in size and hardness during each cold fit, and it seems, in the first instance at least, to owe its enlargement to sanguineous engorgement; subsequently the gland suppurates.

It has already been mentioned, that when intermittents have continued for some time, the lower extremities frequently

become œdematous, the belly tumid, and sometimes even ascites takes place. The first does not denote danger, but the last always occasions an apprehension of an organic lesion of some important viscus. Nevertheless, both may be occasioned by mere functional derangement. In these cases, the thirst is considerable, the secretion of urine scanty, and sometimes dysenteric symptoms manifest themselves.

Appearances found on Dissection.

The following appearances have been observed in the bodies of those who died in the cold stage.—The vessels of the brain gorged with venous blood; and the carotids, after passing into the skull, may sometimes be seen greatly distended with black blood.—The lungs much congested, of a dark colour, which is the condition described by the older writers, by the term "putrid state." In the very few instances which have fallen under my own observation, I have not observed any structural disease in these organs: for, upon making sections, and squeezing them in water, they have resumed their natural appearance and buoyancy.—The heart, and veins near it, are gorged with blood; and sometimes an effusion of blood, or blood serum, is found in the cavity of the pleura. In the abdomen dark-coloured patches are sometimes seen on the peritoneum, occupying a considerable extent of the intestinal tube; and, upon cutting through these portions, all the tissues are found highly injected, and it is probable that this appearance has often been mistaken for mortification.—The liver is sometimes gorged with blood and discoloured; but when treated, like the lungs, in water, this organ is restored to its natural colour, unless it has been altered in structure by previous diseased action, when it is easily broken down, like coagulated blood. I have seen the spleen in a similar state; but was not able, by washing, to restore it to its natural appearance. The stomach and intestines contained, in one instance, a dark, sanguineous-looking matter, like the black vomit.

In corroboration of the above statement, as well as in proof of the pathological and practical views yet to be detailed, I beg to subjoin a short account of some of the interesting cases

and dissections described in the excellent work of M. Bailly,* whose zeal in the cause of science led him to visit Rome in the sickly season, for the purpose of investigating the nature and seat of intermittent fever.

"Case I.—Benoit Simouelli, æt. 30 years, of a strong constitution, affected for some time with a tertian fever, came to the hospital on the 2d July 1822.

"3d, Had a slight febrile access, afterwards took ℥ij. of bark.

"4th, Towards mid-day, he walked in the ward, felt very well, and laughed with the other patients. All of a sudden, he was seized with violent shivering, to which succeeded a very high fever, during which he had alternate flexion and extension of the fore arms, and profound coma. He died in six hours after the commencement of the attack.

"Dissection the following day at 2 o'clock P. M.—Vivid injection of the whole of the arachnoid; colour of the cineritious matter of the brain much deeper than natural, approaching a dark reddish grey; a little water in the ventricles. No false membrane on the arachnoid. Great inflammation of the stomach, especially towards its great curvature, which was every where of a deep, generally diffused red. Many worms in the small intestines, which presented also inflamed portions, especially where the ascarides had collected.

"Case III.—Pierre Donati, æt. 28, of a good constitution, was brought to the Hospital of Saint Esprit on the 2d August 1822.

"An hour and a half after mid-day, he was seized with an accession of fever, which commences by excessive coldness, followed by intense heat, and stupor. He lay upon his back, with his eyes half open. He awoke when any one spoke to him, and fell again into the same state of coma. His pulse was frequent and strong; the skin burning. In the night copious sweating appeared, the intellectual faculties returned, and in the morning he was in a state to answer concerning his health. Took several ounces of bark.

"3d, The fever returned half an hour after mid-day. Commenced with a very violent coldness, followed by heat, and stupor; but nevertheless he always awoke when any one called him, and he opened his eyes. The fore arms were bent upon the arms, and could not be extended; the teeth were clenched, which prevented the state of the tongue from being seen. Sensibility of the skin diminished. He lies upon his back. There is no pain upon pressing the belly. At half past two o'clock, general perspiration, but not so abundant as the first. In the evening, return of sensibility and intelligence. Cessation of contraction of the arms. But the ideas are less clear. Other doses of bark.

"4th, The morning of the third day after his arrival, at half past 7 o'clock, the pulse was frequent; stupidity; together with a drunken appearance. At

* Entitled Traité Anatomie-Pathologique des Fièvres Intermittentes, Simples et Pernicieuses, 1825.

11 o'clock, a return of the cold, subsequent fever more violent; stupor more profound, coma, return of the rigidity of the limbs; subsultus tendinum; he always lies upon his back; pulse full and strong. At half past 3 o'clock, sweat appeared, but less copious. After the sweat, he could not give an answer, and he was unconscious of his own state; cessation of the contractions. Died at 10 o'clock in the evening of the 5th.

"Dissection 12 hours after death.—Lively inflammation of the whole of the arachnoid; serosity between the circumvolutions, with engorgement of the vessels; injection of vessels of the lyra. The brain being raised, there escaped half a pound of blood. Some points of a red colour in the stomach and intestines; liver gorged with blood; spleen voluminous and easily torn. No morbid appearance in the chest.

"Case IV.—Francois Lauretti, shoemaker, æt. 60, of a lean constitution, fell sick on the 17th August 1822. He had the fever every day, beginning with shivering, and terminating in the night by sweating. At the same time he was constipated, and had pain in the epigastrium. Was brought to the Hospital of Saint Esprit on the 24th August. In the evening, the surface of his whole body was of a deep yellow citron colour; said this colour appeared during the last paroxysm; extremities cold, while he had a feeling of internal heat; tongue red and dry; pulse 108, like a thread. He had still so much recollection, that he smiled on seeing us approach him, for we had already spoken to him when he was brought to the hospital, and before he was yet put to bed. He complained of nothing, appeared quite tranquil, and replied perfectly to all that we asked him.

"25th.—In the morning he was found in a state of coma; and died at 10 o'clock, A. M.

"Dissection.—The body was of a lemon yellow colour. On opening the head, the *dura mater* was tinged as yellow as the skin; by repeated washing this tint could in part be removed; but on holding it to the light, the diminution of colour was scarcely perceptible; injection of the arachnoid; cortical substance of a deep colour; yellowish serosity between the convolutions: On slicing the brain, a number of red points were seen; a little water in the ventricles; the cerebellum natural; the lungs healthy; the cavities of the heart appeared to us larger than usual; in the right ventricle, was a clot entirely formed of albumen, as yellow in colour as that of the skin and *dura mater*. The belly, before being opened, was concave, and resting on the vertebral column; the stomach contracted on itself; it was everywhere of the colour of lees of wine: Although it was well washed, there adhered to its surface a thick mucus, similar to the tenacious expectoration of patients labouring under pulmonary catarrh. The smaller curvature, and a portion of the greater, presented that kind of eruption described at No. 30. When examined with a lens, it offered nothing more remarkable than to the naked eye, only instead of appearing to consist of small perfectly round elevations, and entirely separated from each other, they communicated by their bases. The redness of the stomach was less lively towards the *pylorus*, but it began immediately at the duodenum, where it was very intense, and continued without interruption in the small and large intestines. The gall bladder was green external-

ly, and filled with a black and thick bile; on pressing it strongly, only a few drops could be made to pass into the duodenum; the orifice of the *ductus choledochus* could not be distinguished, in the midst of red, bloody, and swollen folds of the mucous membrane of the *duodenum*, but by this means. The *ductus choledochus* being opened, presented nothing remarkable, except that its mouth was drawn into the *duodenum*, in consequence of the swelling of the inflamed tissue of the latter. The liver was of ordinary consistence; its colour was of the yellow of powdered bark: this is the only time I ever saw it in this state. The spleen was of the usual size, and quite diffluent.

"Case V.—Jean Olivier, æt. 49, of a good constitution, was brought to the hospital on the 6th July. He was then without fever. In the evening the fever came on, preceded by shiverings, and followed by violent heat. Pulse strong, 120; coma. He lies upon the back. Right arm immoveable. The left arm bent and carried towards the head. Sensibility everywhere. When an attempt is made to open the left eye, he appears to experience pain, and contracts the eyelids. Belly painful.

"7th, In the morning.—Coma; lies upon the back; pulse strong, 108. He died at seven o'clock, P. M.

"Dissection.—Injection and thickening of the *arachnoid*; engorgement of the vessels which run on the convolutions, which are separated by watery exudations; the left *lyra* greatly injected; watery effusion at the base of the brain; phlegmonous eminences in the stomach, which were of a grey slate colour; invagination of the small intestines; spleen voluminous and pulpy.

"Case VI.—Vincent Orsini, æt. 60, came to the hospital the 3d July 1822, in the following state: Coma; pulse insensible; extremities cold; demi-flexion of the two thoracic extremities; when an attempt is made to extend them, a resistance is felt on the part of the flexor muscles. Left eye half shut, right eye open, pupils dilated, immoveable; tongue dry, lying in the very bottom of the mouth. He manifests pain when pressure is applied to the belly. Died the same evening.

"Dissection.—Vivid inflammation of the *arachnoid*, with great injection of its vessels. There escaped some serum, which was situated between the *dura mater* and *arachnoid*. A fibrous tumour of the size of a large nut, adhered to the dura mater, under the posterior angle of the parietals, and compressed the brain; although the injection of the *arachnoid* was very lively on both sides, it was, however, greatest on the left. Hydatid in the *choroid plexus*, the size of a small pea. The water that was between the *arachnoid* and *dura mater* was more abundant on the left side than on the right; brain pretty soft. General inflammation of the stomach; the S. of the *colon* was of a brownish red.

"Case VII.—Donato Fanti, a collier, æt. 50, was brought to the Hospital of Saint Esprit, in a comatose state, which continued even till death. Puls strong, beating 80 times in a minute; when the extremities were pinched, the patient manifested pain; his skin was hot and moist; when they opened his eyes, he did not direct them to any object. It was impossible to see his

tongue, because his jaws could not be separated sufficiently. He only complained of pain when he was pressed in the region of the liver, and did not appear to suffer any thing when pressed on any other part of the belly.

"Dissection.—On opening the cranium several ounces of blood escaped; the arachnoid was strongly adherent to the dura mater by granulations resulting from old inflammation; the vessels of the brain were very much engorged; on slicing it drops of blood escaped from the divided vessels, which reappeared even after wiping. The liver was blackish; it appeared composed only of black blood, slightly coagulated, and of cellular bands, which alone offered some resistance to the finger; where this weak resistance was overcome, the liver was but of the consistence of thin jelly; for the blood appeared effused in its tissue, which resembled a pulpy mass. The intestines were inflamed in several points, and each inflamed portion corresponded to some knots of worms which were still alive. The lungs, the spleen, and the stomach, were healthy.

"Case IX.—Joseph Totti, horse-doctor, of a sanguine bilious temperament, strong constitution, was accustomed to go down every year to marshy situations, to direct the workmen in seed time, or at the harvest, which occasioned obstructions in the spleen and liver. In 1811, in the time of harvest, being then aged 40, and working with great activity, he was affected with an intermittent fever, which continued till the third paroxysm. At last he returned home; the fatigue of the journey procured for him a very short sleep. I saw him in the fifth paroxysm, when he was in the following state: Agitation; impossibility of finding a position which procured rest; pain under the right false ribs, mounting to the top of the shoulder, and extending to the left hypochondrium; pains in the articulations; head heavy; tongue covered with a white crust, bitter taste in the mouth, vomiting, thirst; face livid; pulse irregular, neither soft nor hard; great difficulty in respiring; urine red and clouded. He got an injection to loosen the belly. He had little repose during the night, for the fever returned, preceded by a general coldness over all the extremities, and the pain in his side was aggravated.

"6th day.—A frequent dry cough without expectoration. The emulsions had eased the thirst. Had no appetite. The bitter taste in the mouth had disappeared. A pound of blood was drawn from the arm; the coagulum was almost soft; the serum was livid. At the return of the fever, the cold only attacked the extremity of the feet.

"7th day.—The pain worse and worse; the difficulty of respiring still greater; frequent eructations; urine always the same. As the tongue was white, and as he had no stools after the lavement, he took ℥i. of manna, which produced a bilious stool. In the night he had no sleep; delirium.

"He became gradually worse, and died on the 14th day, when in the act of raising himself to speak to his Confessor.

"Dissection.—The body offered nothing remarkable but tension of the belly. In the abdomen, there was a sanious effusion mixed with a little blood. The liver was putrid and tuberculous; this affection commenced towards the convex part, extending itself on all sides, and descending towards the concave part; nevertheless, the greatest destruction was on the convexity;

the rest was engorged and inflamed; its volume was natural. The gall bladder contained a little thin clear bile, not viscid. The inferior face of the diaphragm was erysipelatous; the stomach and small intestines were full of water; the spleen double the ordinary size, and of a black colour; the exterior surface of the right lung was covered with a white crust, the inferior part adhered to the *pleura costalis*.

"Case X.—Dominique de Marco, æt. 30, of a good constitution, was affected with a simple tertian fever since the 24th June 1822. On the evening of the 7th July, he was seized, according to the report of his parents, with an accession of the pernicious, comatose intermittent. He arrived at the hospital on the morning of the 8th July, and he was in the following state: Coma; decubitus on the back; face red; fore arms bent and contracted; pulse 112; convulsive trembling of the fingers; legs stretched and immoveable; sensibility every where. They made him swallow three ounces of bark in six hours.

"At 2 o'clock.—Pulse 100; sinapisms to the feet.

"9th, in the morning.—He is in a sweat; remission of the fever; pulse 88; a watchful coma: he hears, but does not answer, although he looks; two hours later, pulse 92, very full; several ounces of bark.

"Evening.—Pulse full, strong, 96; profound coma; resisting stiffness of the right arm; he cannot shew his tongue; skin hot, and always moist with sweat. To make him swallow the bark, it was necessary to pinch his nose, and hold his mouth open with a key; afterwards water was poured in, which he kept in his mouth, and finished by rejecting it. He has taken seven ounces of bark through the course of the day.

"10th, in the morning.—Pulse 140, strong and full; coma; flaccidity; general immobility; mouth open; blood was taken from the jugular; respiration stertorous. Died towards mid-day.

"Dissection.—Injection of all the vessels of the *arachnoid*, even to the very smallest ramifications, and on both sides; but on the right side, and upon the anterior lobe, it was of an intense red, without any distinction of vessels; when it was torn away from the convulsions the *pia mater* was also removed; it adhered so intimately to the *arachnoid*, as to resemble one membrane, red, very thick, and in the tissue of which blood was effused, which appeared immediately to coagulate: little water in the ventricles; the brain of the ordinary consistence: when it was cut, there appeared a great number of red points, which immediately became the seat of large drops of blood; the *arachnoid* of the *cerebellum* was also highly injected, the consistence of that organ was natural. Stomach grey, externally, contracted, slightly inflamed; small intestines presented two invaginations; a portion of this intestine white, transparent, distended with gas; the rest grey and contracted: in three places all the circumference of the tube is red, both within and without, occupying the space of three inches in length; all the large intestine is white, &c. Liver gorged with blood; spleen weighed between two and three pounds, and reduced into a grey, pulpy state.

"Case XI.—Paul Tossini, æt. 30, of a good constitution, was taken on the

morning of the 29th June with a fever, which commenced with heat, and which returned every day until the 6th July, when he arrived at the hospital. He had had thirst, bloody stools, tenesmus, enlarged spleen; and he had taken cooling drinks and a purgative. He is now in the following state: His appearance is stupid; somnolence rather than coma; general pain of head. The patient only appears to be drowsy, for he is easily awoke, and understands sufficiently well what is said to him; decubitus on the back, the knees are drawn up, but he cannot extend the thighs without experiencing pain: during his slumbers the right eye is partly open, the left shut; it is impossible to depress the lower jaw, without producing suffering; the tongue is dry, red, covered with a black crust, which extends from the point towards the middle, the breadth of which is not more than half an inch; the tongue is drawn a little to the right; at intervals, slight convulsive movements of the hands; pain of belly upon pressure; skin hot, dry; pulse 120. When the right arm is extended the flexor muscles contract, and the patient seems to suffer much pain; but when once extended it continues so.

"In the night, bloody dejections, extremely fetid; declination of the paroxysm, which returned on the 7th in the morning; at seven o'clock the patient complained of cold. I did not see him till six o'clock in the evening, when the paroxysm was beginning to decline: the skin was hot and moist; the lips were encrusted; the pulse was not to be felt; respiration hurried; the two fore arms bent, when it was wished to extend them, above all the right, violent pain was produced; preservation of sensibility, every where; sometimes the right eye a little open, the left being shut. He had several convulsive movements this morning and towards mid-day. He took kino before the accession at the moment when he already felt the cold. Increase of coma; died at half-past seven o'clock in the evening.

"Dissection.—General injection of the arachnoid, particularly that part which covers the cerebellum and the lateral part of the commencement of the spinal marrow. The injection of the right side was a little more intense than that of the left, although it was otherwise as vivid as it is possible to imagine, for it was not a simple injection, which merely shews the smallest vessels. The arachnoid was of a deep red, as if all its tissue were penetrated with blood. The brain presented nothing remarkable. The intestines were injected in the same manner, from the œsophagus even to the anus; their whole thickness appeared to be impregnated with blood; they were not either thicker than natural, nor contracted; on the contrary, they were distended with flatus. Spleen weighed from eight to ten pounds; when it was put upon the table, it became flat like a bladder half filled with water; its tissue was reduced to a pulp.

"Case XIII.—François Pompei, æt. 19, was seized on the 1st July 1822 with an accession of fever, in consequence of a sudden chill which he experienced on entering a cool grotto when his body was covered with sweat. He was brought to the hospital on the 2d July at six o'clock in the evening. Before he arrived, he had a considerable epistaxis. He was in the following state; profound coma, eyes widely opened, directed to the right, fixed; expression besotted; general immobility; decubitus on the back; insensibility

of the extremities when pinched, they were quite flexible. He did not answer the questions which were put to him; the direction of the eyes did not change even when one approached him. He manifested pain when his stomach was compressed; skin burning hot; a white œdematous swelling of the face; his parents said that this tumefaction had come on since the disease, for previously he had rather a thin face. This access continued until Wednesday morning the 3d July; he then took an ounce and a half of bark.

"4th July, Thursday morning.—The paroxysm returned, at the commencement of which, he could still give answers to the questions put to him, but the coma went on increasing, and with it all the symptoms above described; the pulse was strong, vibrating, full, beating 84; the same direction of the eyes to the right, the same immobility of these organs, and of the extremities; respiration short. Eight leeches to the ears; died at ten o'clock in the evening.

"Dissection.—Several ounces of blood flowed from the nose in the dead-room; in cutting the scalp, more blood escaped; the whole might have weighed a pound. General engorgement of all the vessels which ramify upon the convolutions; the brain, still covered by the dura mater, gave a feeling which made us believe that there was a fluid in the interior, nevertheless there was only a little serosity in the ventricles; the substance of the brain was of the natural colour. All the intestinal tube, without any exception, presented a red appearance, which was owing to a general injection of all the vessels, even in their smallest ramifications. It would be difficult to inject so perfectly the vessels either of the intestines or of the mesentery, as they were in this body. The intestinal tube, although a little transparent, was penetrated with this congestion throughout its whole thickness; every thing indicated the first stage of a violent inflammation, that is to say, of a sanguineous congestion.

"Case XV.—Thomas Adami, æt. 20, was brought to the hospital on the 23d August 1822. He was delirious; they were obliged to secure him. After mid-day, the delirium subsided. A profound and intense coma succeeded; the pulse was strong, hard, and beat 85; the extremities were flexible, but motionless; decubitus upon the back; pupils immoveable; features swollen and intensely hot; general insensibility. Body covered with a clammy sweat. In the evening the respiration was more hurried, and very much embarrassed; pulse not to be felt; froth was discharged from the mouth; he was insensible even when his skin was pinched; died at one o'clock in the morning.

"Dissection, eleven hours after death.—General inflammation of the *arachnoid*, of which the very smallest vessels were injected; no serosity; the cortical substance was of a deep red, compared with that of a subject dead from a shivering fever, (*la fièvre algide*) which we shall notice by and bye, &c.

"Case XVI.—Antoine Turianne, æt. 12, of a good constitution, was brought to the hospital on the 23d July 1822, at four o'clock in the afternoon. He was in the following state: Commencement of stupor, his answers are slow, and not quite correct; the questions put to him made him discontented and

unhappy; agitation; he turns himself on all sides in his bed; eyes open and stupid; skin hot and dry. (Bled to 8 oz.; lavement; tisane.) In the evening increase of stupor, in consequence of the accession of another paroxysm, coma profound, eyes open, pupils contracted and immoveable; the fore-arms bent upon the arms, no pain on pressing the belly. Sinapisms to the feet.

"24th July, in the morning.—Continuation of coma; pulse 124; head intensely hot; flexion of the fore-arm; it is impossible to depress the inferior jaw. Bled at the feet to 8 oz. In the evening, remission of the fever and of the convulsive symptoms; skin slightly moist; it was necessary to pinch his nose to make him swallow ℥ ij. of bark.

"25th, in the morning.—Return of the fever, and the flexion of the fore-arms; continuation of the stupor; does not reply to questions; insensibility of the skin of the legs, that of the arms sensible; head intensely hot; decubitus on the back; eyes open. Boiling water applied twice to the feet; the patient did not feel it very acutely. Pediluvium during six minutes; snow applied to the head; the pulse fell to 82. Return of intelligence; he swallowed voluntarily the bark; but a little afterwards, violent agitation of all the body came on: the inferior extremities, which from the commencement were cold, were neither heated by the bath, nor inflamed by the application of boiling water and sinapisms. Of the four ounces of bark, which they made him take, he vomited more than two; neither could he retain the bark injections which were exhibited. He remained in this state till 6 o'clock in the evening: the coma returned, and he died at 7 o'clock.

"Dissection.—A very vivid injection of all the *arachnoid;* between its folds there was a membrane produced by the coagulation of effused blood; much serum between the convolutions, and at the base of the cranium; the cortical substance very red. The stomach natural; the small intestines contained a prodigious collection of worms; the inflammation was sufficiently intense in this part. The colon was contracted, its walls very thick, and the internal membrane much inflamed, of a dark red colour.

"Case XXX.—Joseph Maoloney, æt. about 60, came to the hospital on the 21st Sept. 1822. He had been sick for five days. His answers were so confused, it was impossible to find out what had been his previous state, further than that he said he had vomited some bitter stuff, that he was tormented by thirst, that he had suffered great distress, and had pains in the epigastrium. In the evening, tongue dry, vividly red round the edges; constipation, nausea without vomiting, heat natural over the extremities and the thorax; a burning heat in the epigastrium; anguish; severe pain in the stomach under pressure; pulse small, frequent; lavement of barley water—gum-water—fomentations to the belly. During the night, vomiting, and had a stool.

"22d, in the morning.—Pulse more expanded; the ideas still confused, diminution of agitation, heat natural every where; tongue dry, thirst. Same treatment. About half-past 9 o'clock he had vomited the tisane with mucus, bile, and several lumbrici. About half-past 11 o'clock, stupidity, pains in the epigastrium increased. At 3 o'clock P. M. lancinating pain of belly; pulse small, frequent; extremities cold, and bathed in cold, clammy perspira-

tion; inferior extremities bent up upon the belly. Bled from the arm, died in half an hour afterwards.

"Dissection.—Injection of the vessels which ramify upon the convolutions of the brain; substance of the brain presented an infinite number of small drops of blood; three or four ounces of water at the base of the cranium; lungs natural, crepitating. In the belly there were fifteen or sixteen ounces of dark blood, running like oil; spleen ruptured at its inferior part, not by a fissure as in the other cases, but presenting an opening the size of a dollar, out of which came a dark and putrilaginous substance; it was impossible to raise the spleen without breaking it, it was so diffluent; it separated in the hand into two portions, of which one when placed on the table became flattened like jelly, and the other portion remained attached to the diaphragm, which they were obliged to cut to expose the spleen completely; it was not much increased in volume. The stomach was of a reddish brown in the greatest part of its extent; inflammation of all the rest of the intestinal tube; rose-coloured within; bladder natural; liver gorged with blood.

"Case XXXVIII.—Angelo Galetti, æt. 18, of a good constitution, was brought to the hospital on the evening of the 29th July. The patients who were near him said, that during the night, he complained continually of sharp pains in the belly. Took an ounce of bark; the whole of the body was as cold as ice.

"30th, 8 A. M.—Legs, thighs, fore-arms, arms, cheeks, of an icy coldness; the belly, chest, and forehead were of rather a lower temperature than other parts of the body; pulse insensible at the wrists; I could feel it but very feebly in the crural arteries, it beat 100; the patient trembled and complained continually; his most common position was on the left side, with the thighs bent on the belly. He understood what questions were put to him, but not sufficiently well to give proper answers; he never entered into any detail; and died at half-past nine.

"Examination three hours after death.—The small intestines slightly distended with gas, were externally of a purplish red. The internal membrane was of the same colour, so that the violent injection of which they were the seat, had existed throughout the whole thickness of the substance of the intestine. This injection was recent. Inflammation of the upper half of the cæcum. The whole of the great intestine was white externally; on being opened, it presented an inflammation, the violence of which was greater towards the rectum, where the mucous membrane was so intensely inflamed, that some blood had been effused, which mixing with the mucus formed a thick coating, which adhered to the whole of its surface. The colour of all the interior of the colon, and especially of the rectum, was of a lively, intense red: in a word, the most violent degree of inflammation that can exist without disorganization. The stomach was pale; after being washed, it presented, near the pyloric extremity, an infinity of little depressions, from half a line to a line in diameter, and some of which contained in their bottom a small spot of blood, which was easily removed. The folds of the mucous membrane were, besides, nearer each other, and more numerous than ordinary. The mucous coat itself was thickened. The liver was healthy. The spleen

large and pretty hard, but of a redness of the lees of wine. Slight adhesions of the right lung; the same between the whole surface of the heart and pericardium; they were easily destroyed. Injection of the arachnoid, engorgement of the vessels which ramify on the convolutions, and of those which compose the choroid plexus.

"Case XXXIX.—Vincent Crescenzi, æt. 60, of a thin but healthy habit of body, fell sick on the 19th August 1822. He was attacked with fever, which set in with shiverings, followed by extreme heat, pain in the head and belly, vomiting of bilious matter. During the night, the paroxysm terminated in sweating. He was brought to the Hospital of Saint Esprit on the 19th August 1822. The fever returned in the morning, preceded likewise by shiverings, and accompanied by the same symptoms as in the evening; the stomach was painful on pressure; the patient experienced a great heat in the inside; anxiety; depressed countenance, the features were as if flattened to the bones of the face; the colour of the face was natural, the expression dull. (Half an ounce of bark on the decline of the paroxysm.)

"Evening.—Decline of the symptoms; skin wet with a cold clammy sweat; pulse small, frequent; general shivering; pain at the epigastrium; tongue red, but moist; no thirst. (Half an ounce of bark.)

"Night.—The skin remains moist and cool. The patient has vomited the bark.

"He had several paroxysms afterwards; became worse, and died on the night of the 23d, sensible to the last.

"Dissection.—Slight injection of the arachnoid; engorgement of the vessels which ramify upon the convolutions; an effusion of yellowish serum between the foldings of the arachnoid; cerebrum and cerebellum natural; heart and lungs healthy. Stomach grey externally and contracted. Inner surface of a bright red, deeper still towards the pylorus. Foldings of the mucous membrane better marked than usual. Small intestines grey externally and contracted. Internally their redness was brighter than that of the abdominal muscles, which afforded us a point of comparison. To give an idea of this inflammation, the colour of the large intestines could be compared to that which they would receive were they soaked in black blood. This inflammation increased as it approached the S. and the rectum; liver healthy; spleen of a middling consistence, between the state of degeneration and health. This inflammation could be compared only to that of the 30th case.

"Case XL.—Vincent Cola Paolo, of Rimini, æt. 40, of a good constitution, residing at Roma Vecchia, entered the hospital on 7th July. Had been attacked with a paroxysm of fever on the previous evening. On the morning of the 7th, his state was the following:—Hands colder than those of a dead person; pulse 108, small, contracted; hiccup regular in its returns fourteen times in the minute; position supine; sighs drawn easily; answers pretty correctly, he experiences pain in the region of the liver. In the evening, the fit declined, and the hiccup disappeared.

"On the morning of the 8th, senses completely restored, with his natural expression, which, during the paroxysm, assumed that particular aspect, which

characterises those labouring under the fever; but the hands have always an icy coldness which extends half way up the fore-arm; he is not aware of their being cold; but on placing them on his belly, he at once becomes sensible of it; he speaks as if he were in a state of health. At nine o'clock, his appearance became as if besotted; he replied with hesitation and reluctance. Has an inclination to sigh. He lay on the side, with the legs bent upon the abdomen; the fit commenced, the cold gained upon the trunk, respiration became short, some tendency to hiccup; in short he died at three in the afternoon. He took some bark during the apyrexia.

"Dissection.—General injection of the arachnoid, which is thicker than natural, red, and as if doubled by a sanguinolent false membrane; the vessels distributed upon the circumvolutions of the brain are engorged; the stomach is much inflamed in its pyloric half, the rest of the intestinal canal healthy.

"Case XLI.—Angelo Donni, of Milan, æt. 35, weak, lymphatic constitution; preparer of macaroni. On the 5th July 1822, he entered one of the grottos of Monte Testaccio, when he experienced a general sense of cold, which he attempted to shake off by drinking seven or eight glasses of wine; but could not however warm himself. He then felt a great weakness, which was the predominant symptom during the six days previous to his entering the hospital. His state had so little of a decided febrile character, that according to his account, the medical man could not tell him if he had had the fever. He had a sense of general uneasiness; took an emetic and a purgative, and returned to his work; but the general state of disease and uneasiness increasing, as likewise the weakness, on the 11th of July in the morning he came to the hospital of Saint Esprit, on foot, supported by a man on each side. Being arrived in the 1st ward, where I first saw him, he seated himself upon a form, and appeared to feel ill. He let himself fall down upon the right side, but the expression of his countenance was not that of a person fainting. There was something in the motions of his head, of his eyes, resembling those symptoms produced by drunkenness, and not that want of power occasioned by the cessation of the motions of the heart. He was merely supported, and recovered, and he was then enabled to ascend more than 30 steps, in order to reach the clinical ward. When in bed, the following was his condition; pulse frequent, weak; temperature of thighs, legs, hands, and arms, cold; tongue moist and not red. He was able to give a history of his previous state, nevertheless he begged the physician to question his companion, who accompanied him to the hospital, for although he had neither delirium, nor coma, nor syncope, he appeared so confused, so little master of his ideas, that he declined to give any account of it. All he assured us of was, that he had never had the fever. In the afternoon he was twice ill.

"Evening.—Pulse scarcely perceptible, great pains, extremities cold, the left hand more so than the right; it is of a livid colour. Temperature of the belly, and the chest, almost natural; face pale, delirium, agitation, inquietude. (Decoction of bark ℥ viij. Extract of bark, theriaque, ā ā. ℥ ij. Laud. liq. anod. camph. emuls. ā ā. gr. xx. blisters to the thighs.)

"12th July.—At half past one in the morning, sweat general and copious,

but cold. In the morning at the visit, weakness the same; pulse insensible at the arms, which are cold, as also the thighs; the belly is a little warmer, but it is also below the natural temperature; pulse at the temples 114. The blistered surface pale, no water under the epidermis, which remains only detached. He has lost no part of his judgment, but manifests a tendency to drowsiness; complains of no pain, the belly is not tender on pressure; the principal ailment is great weakness. (Blisters to the arms. Bark ℥ ij. in wine.)

"A little later, return of the same symptoms, alternating with delirium and drowsiness; general and intense sense of cold; died at half-past five in the afternoon.

"Half an hour after his death, the body was warmer than during life.

"Dissection.—Stomach highly inflamed between its great curvature and the pylorus. Intestines presenting traces of inflammation in some points. Spleen soft and pulpy, liver healthy, old adhesions of right lung. Before opening the cranium, the head was separated from the trunk, when there escaped by the occipital foramen a great quantity of bloody serum. Injection of the arachnoid in its minutest ramifications, but a little more on the left than on the right side. Great engorgement of the vessels distributed on the circumvolutions, more marked on the left side. Grey substance of the brain, of a pale, rather than of a deep hue; choroid plexus pale; serosity between the circumvolutions; brain of a soft consistence."

From these and other cases it appears, that M. Bailly found in thirty-three dissections, more or less extensive disease in the brain: in twenty-two of these there was thickening, and other marks of inflammation, in the arachnoid coat; and in eleven, inflammation of the substance of the brain. In twenty cases there was gastro-enteritis. In four cases gastritis by itself, and also four of enteritis, uncomplicated with gastritis. In eleven the spleen was softened; in some instances enlarged; one weighed from two to three pounds, and another from eight to ten pounds. In two cases the spleen was large and hardened. In three cases the spleen was ruptured, and in one it was gorged with blood. In two cases the liver was softened; in four gorged with blood; and in one case inflamed. In one case the gall-bladder was inflamed. In two cases there was pericarditis. In three, peritonitis. In one, pneumonitis. In one case there was inflammation and enlargement of parotid.

These statements respecting the appearances on dissection in Intermittent Fever, will be found fully corroborated in the

works of Morgagni, Pringle, Cleghorn, Chisholm, and Fellowes.

Causes of Intermittents.

In point of form, I ought now to treat of the causes of Intermittent Fever, but having explained myself so fully on this subject, when treating of the causes of fever in general, at page 44, it is unnecessary to do so in this place, further than to repeat my conviction, that the effects of internal irritations, sudden variations of temperature, and of evaporation, as causes producing Intermittents, have hitherto been too much overlooked.

Pathology of Intermittents.

As there are three distinct stages in this disease, it will be proper to treat of the pathological condition of the body during each.

Cold Stage.—Perhaps the first link in the chain of morbid action may be in the nervous system; there is decided evidence of its being involved from the beginning to the termination of the disease. But as there is nothing to guide us in the investigation, I shall not enter into it. The first circumstance which we distinctly perceive, is diminished circulation of blood in the extremities, then a sense of coldness, and with it a feeling of weakness. These are evidences of an irregular determination of blood, by whatever cause produced; and in proportion as blood accumulates in the vessels of internal organs,* their functions become impeded. The lungs shew their gorged state, by the short, difficult, and anxious breathing; by the impossibility of inflating them beyond the least degree; and by the violent dry cough which occasionally takes place. The livid appearance of the cheeks, lips, and

* This is the state termed congestion, which implies, that the balance between the arterial and venous systems is deranged for the time, the latter being overloaded or congested with blood, and not that the circulation in any organ, or set of organs, is entirely obstructed, which nevertheless does actually happen in those extreme cases in which re-action does not take place, and the individuals die in the cold stage.

mucous membrane of the mouth, is an additional proof of the embarrassed state of the lungs, shewing that the blood is not properly de-carbonized. The disordered functions of the brain in this stage, depend, I imagine, principally upon the gorged state of the lungs, and also upon the overloaded state of the right side of the heart, preventing the free return of blood from the head. The disordered functions of the brain may also be produced by a change in the balance of the circulation of the vessels of the head, independently of the state of the lungs and heart. The tremors may probably be attributed to an accumulation of blood in the vessels of the brain and spinal marrow. The sense of cold seems to be owing partly to the state of the nervous system, and partly to the state of the lungs. The pain in the head and loins, and oppression at the præcordia, may be fairly attributed to the same causes. The muscular prostration, and feeling of sinking, are not owing to actual debility, but to obstructed action, in consequence of the above-mentioned condition of organs. The proof of all which circumstances is to be found in the fact, now well known, that abstracting blood, in the cold stage, will immediately remove not only the difficulty of breathing, the pain in the head and loins, the disordered functions of the brain, (when these exist,) the oppression at the præcordia, &c. but will also stop the rigors, restore the strength of the pulse, increase the heat of the whole body, and cause the sensation of cold to vanish in an instant. Cullen and others believed, that all the subsequent phenomena of fever depend upon the cold stage, which, although a mere hypothesis, is now for the first time proved to be true.

The pathological views which are still taught in most of the schools of Great Britain may now be stated, and this shall be done in the words of the late very celebrated professor of physic, Dr Gregory: "The languor and debility depend upon diminished nervous energy: the uneasy feelings, on muscular debility; the paleness of the face and extremities, and shrinking of the features, are owing to spasm of the extreme vessels; the coldness is to be explained by the blood being propelled from the surface by debility, or prevented from entering the vessels by the spasm; thus the cold may

be produced either by the spasm or by the debility; the tremors depend upon debility of the muscles, but there is also some irregularity of nervous energy; the breathing during the cold stage is small, frequent, and anxious, owing to debility of all the muscles that serve for respiration, while, at the same time, the *congestion* of blood produced by the weakened action of the heart, would require the breathing to be often repeated, and the respirations to be fuller than natural, which circumstance tends to increase the uneasiness; the heart partakes also of the debility; this debility of the heart produces an accumulation of blood in the great vessels, and this occasions that unusual motion of the organs of respiration, termed yawning. Want of appetite, nausea, and vomiting, are owing to debility of the fibres of the stomach. Costiveness is produced partly by spasm. Failure of attention and memory, and also delirium, are owing to debility."

On perusing these statements, the reader will observe sufficient proof of the pathological condition of the body which I have described, but instead of attributing it to the same state of organs, he places spasm and debility as the cause of each phenomenon; thus most unphilosophically, like the rest of the disciples of the Cullenian school, he makes the facts to suit the doctrines. Influenced, as this distinguished man's mind was, by such erroneous pathology, it is no wonder that he should have pronounced the following dogma: "I have no doubt, therefore," said he, "that the causes producing fever, act first by inducing debility; and accordingly we find, that stimulants employed at this period have produced good effects in checking this disease, while evacuations, as *bloodletting*, which, at another period of the disease, might have been proper, if employed in the *first stage*, *never fail to be attended* with most dangerous consequences; or it is, to use the words of Celsus, '*hominem jugulare.*'"

I shall now show that this is a statement which Celsus never made with reference to the cold stage of intermittent. On a careful reference, I find no allusion made to such a practice in his works; but in treating of the danger of bleeding in *vehement fevers*, he expresses himself thus,—"*Quod si vehemens febris urget, in ipso impetu ejus sanguinem mittere,*

HOMINEM JUGULARE EST."—Lib. ii. cap. 10. It appears to me that Dr Gregory was led into this error by a statement made by Sir John Pringle, who, in allusion to the good effects of bleeding in the camp fever which he describes, observes at page 210, (Observations on Diseases of the Army, Ed. 1768,) "A person unacquainted with the nature of this disorder, and attending chiefly to the paroxysms and remissions, would be apt to omit this evacuation, and to give the bark prematurely, which might bring on a continued inflammatory fever. A vein may be safely opened either during the remission or *in the height* of the paroxysm; for besides that I have observed the remission to come sooner and fuller after hemorrhage, I have repeated experience of the safety of bleeding *in the hot fits;* and not only in this, but in the marsh fever, even after it had come to almost regular intermissions. In order to make Celsus's maxim (he quotes the above passage from lib. ii. cap. 10.) consistent with this practice, we must interpret his term *impetus febris* in the sense of that chillness or cold fit which preceded the hot one in the fevers which he describes, *for then indeed bleeding would be improper.*" This is straining an author's statement to suit other views with a vengeance! The meaning of Celsus is clear and precise,—he makes no allusion to the cold stage. Does not this show how liable we are to be misled by the authority of a name?

Hot Stage.—Acting upon the principle of not inquiring into occult causes, very little need be said respecting the circumstances which produce the re-action; but there has long existed a pretty general belief that the blood accumulated about the heart, in the cold stage, proves a stimulus to that organ, and produces re-action. In this manner Dr Gregory and others make the spasm of the extreme vessels the cause of the diminution of blood on the surface; and then he observes,—"The blood thus driven upon the internal parts, must accumulate in, and prove a stimulus to, the heart and great vessels."

The next question comes to be, how is this effected? The truth is, that we know nothing of the matter; and, after all, it is perhaps best to attribute it to "*the principles of life*," or,

in the language of Cullen, to the "*vis medicatrix naturæ*," which is ever in action, to prevent injury, and to remedy the evil after it has occurred. The phenomena which are ascribed to the state of re-action, are those, *the combination of which* is denominated fever; namely, hot and dry skin; quick pulse; thirst and loss of appetite; restlessness and anxiety; headache, and occasionally delirium; hurried respiration; dry, furred tongue, &c.

With respect to the heat and dryness of the skin, the old opinion of Boerhaave need scarcely be alluded to, who attributed this condition to the friction of the globules of the blood against the sides of the vessels; neither is it necessary to dwell upon the still older opinion, which attributed the heat to fermentation; nor is it requisite, after what has been previously stated in this work, to say a word more respecting spasm of the extreme vessels. The heat and dryness of the skin in the second stage of intermittent are, no doubt, owing partly to the suppression of the secretions and excretions; also, probably, to some change in the nervous system, but principally to the increased quantity of blood driven to the surface of the body.

Sweating Stage.—It has been stated, that, in cases in which no organic lesion exists, the pains and uneasy feelings begin to subside after the commencement of the sweating, and soon afterwards disappear. An interesting question here presents itself, How does the perspiration produce the effect? It appears to me that it acts in two ways; *first*, cooling the body by evaporation; and, *secondly*, it moderates the force and frequency of the heart's action, by depleting the system. It is impossible to state the precise quantity of fluid perspired in such cases; but, if I can trust the hasty, and far from accurate observations made respecting this point, by placing oil-skin on the outside of the bed-clothes, I am inclined to believe that it amounts to considerably more than two pounds; and it must be kept in view, that this discharge comes directly from the blood itself.

Treatment of Intermittents.

It was formerly a matter of high dispute among physicians,

whether an intermittent fever ought to be immediately cured, or allowed to run its course. Many believed that the system is benefited by the disease,—that the febrile symptoms, in fact, are the natural cure of some other disorder in the constitution, —and they argue that curing it must be hurtful. Some still assert that the disease will cure itself; and therefore, that it is improper to apply any remedies, except laxatives, to keep the bowels open.

The best maxim in physic is, to get rid of diseased action as quickly as possible, as there is no saying what mischief is to follow in the train of consequences. "There could not be a moment's hesitation," says Dr Fordyce, "in determining to restore the patient to perfect health at once, were there any remedy or mode of treatment that would certainly prevent the returns of the paroxysms of a tertian intermittent, and take off the symptoms remaining after the crisis, so that no other disease should follow. But there most undoubtedly is no medicine uniformly efficacious, or that always leaves the patient in tolerable health, and secure of not being destroyed by the remains of the disease, or by any other disorder arising in consequence of it."—"Were there any such, why should different practitioners attach themselves to particular varieties of bark; recommending the brown, the yellow, or the red, with such decided preference? Why should they prefer arsenic or zinc, if any one were uniformly successful?"

The discovery of such a remedy has always been a great desideratum; and although no one remedy has yet been found out, I believe bleeding, in the cold stage, conjoined with laxatives, and the occasional use of the sulphate of quinine, to be as certain a mode of treating intermittents, as any other set of remedies can be said to be certain in the treatment of any other class of diseases.

Treatment in the Cold Stage.—As the cold stage demands different management from the hot, and both of these from the sweating stage, and all these from the intervals between the paroxysms, I shall treat of the means to be used in each stage, and then describe the plan which ought to be adopted in the intervals, to prevent a return of the complaint. In the cold stage, which generally lasts from half an hour to two or

This is more to bleeding and in Low fevers very large quinine previously — for days. the results of this practice

three hours, the first thing to be done is to endeavour, by every means in our power, to restore the heat of the body, and to relieve uneasy feelings, with a view to shorten its duration, and bring about re-action. Hot applications; additional bed-clothes; warm drinks; stimulants; opiates and æther, have been strongly recommended,—with how little success, every experienced man can testify. The best method of applying heat is, to surround the patient with bottles filled with hot water; and it affords considerable relief, when a sufficient degree of heat can be applied to the epigastric region. It appears to be more efficacious than the general warm bath, in which I have seen the patient shiver, and complain loudly of cold, when the bath was heated above 100°. It is a common plan to give a bumper of gin or brandy, with some pepper, to create re-action, and cut short the cold stage; and there can be no doubt that it has sometimes succeeded; but I have seen much injury ensue in many cases. This enables us to account for the horror entertained by the older writers, at cutting short the cold fit, because it was never attempted by any other means than by ardent spirits, large doses of opium, and æther. Dr Gregory used to mention, in his lectures, two cases of violent epistaxis, succeeding to doses of brandy and pepper, which reduced the patients to great weakness. In the instances which fell under my own observation, and to which I have already alluded, fever and violent cerebral symptoms succeeded, and in two or three instances, local inflammations.

Bleeding, in the cold stage, will, in a great majority of instances, cut it short; in fact, it will rarely fail in stopping the existing paroxysm, and, on many occasions, it has prevented a return of the disease to which the patients had been long subject, and by which they were nearly worn out. It is difficult to determine what quantity of blood it will be necessary to draw in any given case; sometimes it requires twenty-four ounces; I have known three ounces suffice, and, in one case, an ounce and a half produced the full effect. The larger the orifice in the vein, the greater is the chance of arresting the disease at a small expense of blood; but, in many cases, the operation is attended with considerable difficulty, from the convulsive tremors which affect the whole body. I was once

successful in arresting the disease by bleeding, in a cold stage which had continued twenty-six hours; but I regard this as an extreme case. The blood sometimes only trickles down the arm, and, as the system is relieved, the stream becomes larger and stronger, till at last it springs from the orifice, and frequently before six ounces are taken, the patient will express relief from violent pain in the head and loins, and it will soon be observed that he breathes more freely. The tremors become slighter and slighter, and, by the time a few more ounces are abstracted, they will cease altogether, and with them will vanish the painful sensation of cold. The pulse will be found stronger, and a gentle moisture will be observed on the body. If the patient be properly managed with respect to bed-clothes, neither hot nor sweating stage will in general follow. Most of the patients who have been treated by myself, or by my pupils under my immediate inspection, have fallen asleep immediately after the operation; but some have even got up and dressed themselves.

The best testimony which can be offered in favour of bleeding in the cold stage of intermittents, is to annex a condensed history of some of the cases treated by myself and others in this country. Indeed, I have been blamed by many for not having done so in the first edition, but time has enabled me to perform this duty with more confidence, for I have now the satisfaction of adding an account of the happy results of the practice in India.

"Case I.—James Ward—admitted into Royal Ordnance Hospital in November 1823. Has had several attacks of intermittent annually, since the year 1809, when he served in the expedition to Walcheren. Of late his indispositions were long, and left him more and more debilitated. He was bled twice in the hot fit, to relieve the severity of the symptoms, and with considerable temporary relief, but without preventing or mitigating the violence of the subsequent paroxysm. He was afterwards bled from a vein in the arm, during a very severe cold stage; the rigors were violent, and the sense of cold insupportable. He complained much of his head and loins, the face was of a livid colour, and the vessels of the conjunctiva turgid with blood. Pulse 100 or 105, and oppressed; breathing short and anxious, and, to use his own expression, he felt "a heavy load about his heart." When the vein was opened, the blood trickled slowly from the wound, but it soon came in a jet. When 8 ounces were taken, the rigors ceased, and he expressed great surprise at the suddenness of the relief; when 12 ounces were abstracted, he was free from all complaint, and his skin had a comfortable

moist feel. He enjoyed a good night; he had no return of the intermtttent; and his recovery was rapid.

"I had an opportunity of seeing this man daily for some months afterwards, and his constant tale was, that he "had not felt so well, or so much of a man," since he went to Walcheren. The only remedies used after the bleeding were laxatives and infusion of quassia.

"Case II.—James Atkinson, aged 33, had formerly had repeated attacks of ague. Was seized with severe rigors when on the top of the Carlisle mail, travelling to Edinburgh. The paroxysm was evidently produced by exposure in bad weather, first to rain, and then to a keen frost, with wet clothes. When I visited him in the hospital, he had laboured under the rigors for no less a period than twenty-six hours,—in truth, it was the most severe cold stage I had ever seen in any country, with severe pain in the head, back, and loins; oppression at præcordia. Warm drinks, stimulants, and hot applications, had been employed without benefit. The agitation of his body was so great, that it shook the very bedstead on which he lay, and threatened to terminate in convulsions. Tongue loaded, but moist; breathing hurried and laborious; pulse 65, oppressed; skin not below the natural standard over the trunk, but all his extremities were cold, and he complained of a sensation of extreme coldness. Fortunately, I made a good orifice, and the blood flowed in a good stream; the first pound was abstracted in three minutes, with very trifling relief, except to his breathing; but during the flow of the second pound, which occupied three minutes, he became more and more easy, and the rigor ceased completely. His body, and even the extremities, became of a proper temperature, and his skin felt moist; the pulse rose from 65 to 106; he passed a good night; had several stools during the next twenty-four hours, and was found perfectly easy next day. On the following day he was convalescent, looked well, asked for more food, and had no return of the disease.

"Case III.—Thomas Bullock, a strong healthy young man, reports that he had had the disease in the tertian form for twelve days. Attributes it to exposure to cold when on sentry in the arsenal at Woolwich. He was in the sweating stage when brought into the hospital at Leith Fort, on the 4th March 1826.

"On the 6th had another paroxysm.

"8th.—Cold fit came on at three A. M. After it had continued half an hour and was well formed, his pulse beating 84 and oppressed, a vein was opened in the arm by Mr Marshall, (now assistant-surgeon of the 87th Regiment,) in the presence of several other gentlemen. When 15 ounces of blood were abstracted, the rigor ceased; the pain of head and loins, and the oppression at præcordia, vanished; the breathing became natural; the pulse rose to 95. In half an hour after the operation, said he felt quite well; no hot fit followed; a very gentle moisture appeared on the surface, but there was no sweating stage; pulse 95.

"18th.—Was again attacked with rigors a quarter of an hour before the visit. He is now in a severe well-formed cold fit; breathing hurried and laborious; the whole body is in a tremor; tongue rather loaded; passed a bad night; pulse 120, oppressed. Attributes this paroxysm to cold when in the privy. A vein was opened in the arm, and 14 ounces of blood were abstracted before the

fit was subdued; there was no tendency to syncope; pulse 110, full, and of good strength. No hot stage; no sweating stage followed.

"19th.—Yesterday, for some time after the bleeding, he appeared free from all complaint; but towards evening was attacked with violent headache and pain in the belly. Blood was again taken from the same orifice, to the amount of 12 ounces, with complete relief, since which he has been easy and slept well; bowels slow.

"20th.—Slight chill this morning, which appeared to be cut short by a warm drink; no fever followed; passed a good night; bowels not moved.

"22d.—Had a slight sensation of cold this morning, but there was no hot stage; says he feels quite well; bowels slow.

"23d, 24th, 25th.—Reports state that he went on improving.

"26th.—Says he does not feel so well; but there has been no tendency to rigor; bowels bound.

"31st.—He went on improving in health, and without any return of the disease till this day. He was found at the time of the visit in a slight hot stage, after having experienced a slight rigor, which lasted for twenty minutes; tongue white and loaded.

"April 2d.—Had a severe rigor at 10 A. M. which was followed by fever and sweating; at 2 P. M. he was found quite free from complaint.

"His health went on improving gradually till the 25th, when he was discharged the hospital cured.

"The same individual reported himself sick on 30th May following, and was taken into hospital, after a severe paroxysm of intermittent. On his admission, he stated, that since his discharge, his health had been very good, and his strength increasing, but that he has had three slight rigors; his appearance, however, is much improved.

"31st.—Says he expects the paroxysm to-morrow morning at nine o'clock; bowels regular; appetite good.

"Was ordered to take three grains of sulphate of quinine every half hour, commencing three hours before the expected time of attack.

"June 1st.—He took six doses of the quinine; escaped the paroxysm; had no return afterwards, and was discharged on the 4th.

"Case IV.—Robert Smith, a stout man, whose health had formerly suffered from a residence in a warm climate, states, that he had had an intermittent fever five years ago when stationed at Woolwich, but has not had a return of the disease till now. Was taken into hospital at Leith Fort on the 7th March 1826, labouring under febrile action, which he said succeeded to a severe rigor; the febrile symptoms continued with disturbed sleep till the 13th day, with little variation. He was then seized with a severe rigor, attended with sensations more than usually distressing; above all, he complained acutely of his head. He was bled during the cold stage to twelve ounces, when the tremors and the other symptoms ceased at once; he soon after fell into a profound sleep, his skin having a gentle moisture; there was no hot stage.

"Escaped an attack till the 22d, when he had a severe paroxysm, followed by intense headache, for which he had leeches, cold applications, and a blister applied. He afterwards took sulph. quininæ.

"Case V.—William Macauley was admitted into the Royal Ordnance Hospital on Wednesday 31st May, labouring under a severe hot fit, attended with the usual symptoms.

"June 4th.—The paroxysm took place at 1 o'clock P. M. this day; about 12 o'clock the pulse was counted, and was found to beat 84, and oppressed; the precursory symptoms had just commenced; at half-past 12 the pulse was 66, and still more oppressed, This rigor was very severe; the tremors of his body shook the bed, and his sense of cold was insupportable, at the time that a thermometer placed under the tongue stood at 100. He complained of great oppression; pain of back and loins; difficult and hurried respiration. The rigor was allowed to be formed for 10 or 12 minutes before a vein was opened; 24 ounces of blood were then drawn, the rigor ceased, and all its unpleasant symptoms.

"He had about eight *slight* paroxysms after this, and was subsequently cured by the use of quinine.

"Case VI.—Alexander Clark, a stout well-made young man with a florid complexion.

"Came into hospital at Leith Fort on 26th May 1826, with the fourth paroxysm upon him. He was attacked at 7 A. M. with rigors; the fit was very severe. The hot stage had given way to the sweating when I saw him. He could assign no cause, except that he had done duty at Woolwich a few months before. Tongue foul; fever diet.

"23d.—Was free from complaint yesterday; had six stools from the laxative. The rigor came on this morning at half-past six, and went through the regular stages with the usual distressing symptoms. Tongue much loaded; B. regular; no appetite; urine scanty.

"Experienced severe paroxysms on the 24th and 26th, attended with headache and a severe pain in right hypochondrium.

"28th.—Rigor came on at 11 A. M. Five minutes after it was well formed, a vein was opened, but the operation was badly performed, owing to the violent tremors; 20 ounces of blood were slowly drawn, when the rigor ceased, together with the tremors, the difficulty of breathing, the oppression at præcordia, and the headache, &c. The painful sense of cold gave way all at once to a pleasant feeling of heat, and the pulse became natural. The bleeding was not carried the length of producing syncope. No hot stage followed, and the skin was covered with a gentle moisture. In half an hour his only complaint was of slight nausea.

"He had several slight returns of the disease, and ultimately recovered under the use of quinine.

"Case VII.—Mr Marshall, assistant-surgeon of the 87th Regiment, when on a visit in the west of Scotland, was called to see a middle-aged man who had served in the army in a warm climate, and who had suffered most severely for some years from intermittent fever. Every kind of remedy had been tried in vain, and he gladly submitted to the treatment of bleeding in the cold stage, which Mr Marshall had seen so successfully performed in similar cases.

"12th.—The cold fit is very severe; the feet cold; heat of the superior extremities rather above the natural standard, and moist; pulse very small, not easily perceived; pain of head excessive; great thirst; pain in back consider-

able; complains of distressing sense of weight at the præcordia. A vein was opened, and the blood trickled down the arm, but shortly came in a full stream. When 10 ounces of blood had flowed the shivering ceased, and all the bad symptoms vanished. Half an hour after the bleeding, says he is quite well. On the 14th, 16th, 18th, no return of fever." Mr Marshall assured me that he had no return of the complaint when he last visited him, which was several months after the bleeding, and that the cure seemed to be as sudden, and apparently as permanent, as that which took place in Ward's case.

"Case VIII.—George Scott, aged 36, a native of Eyemouth, was seized with an intermittent of the quartan type when in Lincolnshire in August last. He had used various remedies, and among the rest bark, without relief. The paroxysms have continued with such regularity, that he has not escaped a single attack since the commencement of the disease. His health and strength have suffered so much, that he has been unable to work for a considerable time, and came to Edinburgh almost in despair, to seek relief. His look is meagre and emaciated; and he appears the wreck of a strong and active man.

"On Thursday 28th December 1826, at 2 P. M. the rigor commenced, and when it had continued for half an hour, I opened a vein in the arm, having placed him in the sitting posture; his whole body was affected by violent tremors, his teeth chattered; he complained of intense cold; dimness of sight; severe pain in the back part of the head, and in the left side, loins, and inferior extremities; his pulse was quick and fluttering, so as not to be counted, and the countenance expressed great suffering. Owing to the violence of the tremors, a bad orifice was made in the vein, and the blood flowed slowly. When about twelve ounces were abstracted, the rigors diminished, the uneasy feelings began to subside; and by the time 16 ounces were taken, he was free from tremor and pain, and said he felt quite well. The pulse was now a good pulse, but I neglected to make a memorandum of its number at the time. He showed some tendency to syncope before the arm was tied up. Several gentlemen were present when the operation was performed. He was again visited in an hour, when he was found breathing naturally, in a calm sleep. Pulse 84, and of good strength. I was told he had been very faint, and had vomited immediately after we had left the house.

"Saturday 30th.—He came to the dispensary at the visiting hour, and said that he felt himself 'a new man.'

"Sunday 31st.—He came to the dispensary again, and was there seized with a paroxysm a little after the hour of visit. The fit was preceded and accompanied by much slighter pains and general disturbance than in any former attack. In about ten minutes after the fit could be said to be well formed, the rigors were very severe, the tremors violent, and the feeling of debility was so overpowering, that he declared he could not support himself longer on a chair; his breathing was quick and laborious, and his teeth chattered; I tied up his arm and opened a vein, and before *three ounces* were abstracted, the paroxysm ceased, and with it all the other unpleasant symptoms. Although a minute before he had declared that he could not sit up a moment longer from debility, yet he now said he felt his strength restored, and had no wish to lie down; in less than ten minutes, I had the pleasure of seeing him running home. There was no subsequent heat of skin, and no sweating; his pulse, before he left the dispensary,

was 86, and of good strength; whereas before the bleeding, it was 100, and so weak as scarcely to be counted.

"Monday, 1st January.—I sent to inquire how my patient felt; the messenger was told that he had had a good night, and was out making merry with some friends.

"On Wednesday he had a slight chill without subsequent fever or sweating; he afterwards got the sulphate of quinine, and had no more of the disease.

"Case IX.—A woman, 27 years of age, the mother of several children, experienced repeated paroxysms of irregular intermittent for several months, till at last her general health became much impaired under the disease in the tertian form. She was bled by Mr Drever, one of my pupils, towards the termination of a slight cold stage. About 12 ounces were abstracted; neither re-action nor a sweating stage followed; and there has since been no return of the complaint, although several months have elapsed. She had neither bark, sulphate of quinine, nor arsenic. In fact, no medicines were prescribed but those of a laxative nature.

"Case X.—David Lambert, ætat. 36, sailor, residing at No. 9. Couper Street, North Leith, states, that he was attacked with intermittent for the first time on the 9th May 1827, when on his voyage from Bourdeaux, in the ship Enterprize of Newcastle. At the time of attack they were off Dover in very bad weather, ten days from Bourdeaux. Since then the paroxysms have returned daily, the cold stage continuing for three quarters of an hour, often for upwards of an hour. It has always been severe. His general health soon gave way. He left the ship, disabled, and arrived in Leith on the 30th May. When I visited him, he appeared to be very unwell, feeble, feverish, restless, and anxious about his fate; fearful of the consequences of the approaching cold stage, which he expected in a few hours. Says he sleeps little; has constant thirst and diarrhœa; pulse 100; tongue white and loaded, but moist; has a bad cough with expectoration; slight difficulty in breathing; and constant dull pain in the chest and loins; appeared debilitated; lies much in bed, and when he sits up complains of swelling of the feet and legs, which are œdematous; stethoscope announced bronchitis generally in both sides of the chest. The captain of the ship gave him something in treacle, which he supposed to be bark. Mr Henbest and Mr P. Mackintosh, two of my pupils, volunteered to watch the case, with a view to bleed in the cold stage. The remainder of the history is taken from their report.

"'June 7th.—Found him very unwell; coughing incessantly and violently; complaining of sense of weight in the chest; pain of head and giddiness; cold extremities; pulse 95, and oppressed. At 20 minutes before 8 P. M. he was seized with rigors, which soon became very severe. The breathing was hurried and laborious; his cough and other symptoms greatly aggravated. The whole body was in violent agitation, and his teeth chattered. When in this state, a vein was opened in the right arm, and four small tea-cups of blood abstracted, (about 16 ounces.) He was so suddenly and so perfectly relieved, that he declared he felt quite well, his body became warm, and he soon fell into a quiet slumber. Pulse natural. After regulating the quantity of bed clothes, we took our leave.'

" ' 9th.—By account had a very slight chilliness last night; the whole paroxysm being of short duration; there was scarcely any heat, and very little perspiration. In fact, he said there were none of the bad attendants of the previous attacks. He was again visited at 9 P. M. and found in the cold stage, which lasted only ten minutes. The shivering was so very slight, as scarcely to be perceptible. Passed a good night; was able to sit up a considerable part of the day; strength improved to his own feelings. The cough still continues with the expectoration. Passes dark and fetid stools. Calomel and rhubarb. A blister to the sternum. Milk and farinaceous diet.

" ' Had an attack on the 10th, and another very brief one on the 11th; from which date till the present day, June 29, there has been no return of the disease. There is no affection of the chest; his aspect and motion bespeak health, and his strength is perfectly restored, without the use of bark, quinine, or arsenic.' My reporters state, that on the 19th, the patient expressed himself in the following terms: " If any man had told me, twelve days ago, that I should be so well as I am now in six months, I could not have believed him."

" Case XI.—Corporal Geo. Webster, Royal Artillery, has served thirteen years, three of which were in the West Indies, where he enjoyed excellent health; but since his return, has shewn a tendency to chest complaints; has been once in this hospital with a bad catarrh, from which, however, he recovered. He presented himself again at the hospital at Leith Fort this day, June 24, 1827, and stated, that he had for some days past suffered from rigors, alternating with flushes of heat, and attended by pain in the loins and belly, diarrhœa, and slight nausea. His pulse was quick, and tongue loaded. He got an emetic, and daily laxatives, and was discharged on the 29th, supposed to be cured. He re-appeared on Thursday, 5th July, and reported, that since his discharge on 29th *ultimo*, he had experienced three regular paroxysms of intermittent, with a day intervening; the last attack was this morning. The cold stage was very severe, and continued for two hours; it was succeeded by the hot fit, and terminated in sweating. Complained much of general pains, but suffered distressingly from headache during the paroxysm. He got nothing but laxatives; and had attacks on the 7th, 10th, 12th, and 14th. He escaped from the 14th till the 20th, when he had a very violent paroxysm; and on the 22d, he was bled in the cold stage, and the following report was made at the time: The cold fit is severe, accompanied by violent pain in the head and belly, and oppression at præcordia, head 95°, pulse 105, weak and irregular, respiration hurried and difficult. When the cold fit had continued for ten minutes, a vein was opened; the blood trickled down the arm at first, but afterwards came in a good stream. When about eight ounces of blood were taken, the pains every where ceased, the tremors became slighter and slighter, and were completely stopped before sixteen ounces were abstracted. He then felt a slight tendency to syncope, and the arm was tied up. He spoke much of the sudden and complete relief he had experienced, and contrasted his present situation with the pains and oppression he had had in previous paroxysms, which always continued till the sweating stage had gone on for a considerable time. His pulse now beat 75, strong and full, heat 100°. No hot or sweating stage followed the bleeding. Four hours after the bleeding, he was again visited: pulse 110, of good strength, skin hot

from pressure of bed-clothes, which were now carefully removed, to his great relief.

" 23d.—Says he has not been so well since first attacked ; feels, if any thing, rather stronger, slept well, bowels open, appetite pretty good, and had no return of the disease. Had no medicines but laxatives and infusion of quassia.

" Case XII.—Bombardier James Armstrong, aged 19, is tall, spare, and pale ; says he always enjoyed good health till fourteen days before he left Woolwich, when he was seized with intermittent fever. After the first fit, he had no return for nine days, which he attributes to the use of bark, which was prescribed for him in the General Hospital. But when taking the bark, and while yet in hospital, he was again attacked, and had a paroxysm every day for four successive days. He still continued to take the bark in the intervals. He was removed from the hospital on Wednesday the 11th July, to embark with his company for Leith Fort. He escaped a paroxysm on the following day, but had one on Friday the 13th, and every day since.

" 20th July 1827.—Presented himself at the hospital at Leith Fort, this morning. States, that the paroxysm came on at 7 A. M. which was very severe, particularly in the cold stage. Says he suffered most from headache, and a trembling feeling, together with a tightness at his breast. Feels now considerable prostration of strength ; has no appetite, tongue white, not much loaded ; thirst ; bowels have been very open for four or five days ; pulse 100, and full.

" 22d.—Paroxysm came on at 7 this morning. Was bled in the cold stage, after it was well formed. He says the fit was very violent, and that his sufferings were produced by severe pain of head, difficulty of breathing, and tightness across the chest. Pulse so quick, irregular, and small, as not to be counted. When about an ounce of blood was abstracted, he felt much relieved ; immediately afterwards the rigor ceased suddenly, the sense of cold gave way to a comfortable feeling, and all the other painful sensations vanished ; and not more than eight ounces of blood were drawn. In the course of a quarter of an hour, said he was sensible of a little heat and slight thirst. Was visited four hours after the bleeding. Says he feels quite well, and declares he never felt so well, or so free from uneasiness in so short a time after any previous attack, and that he has no feeling of debility, which he used to have. Heat under the tongue in the cold stage was 105° ; heat taken at this visit 100, pulse 76, full and strong. Has had no stool to-day.

" 23d.—At twenty minutes before eight this morning felt a slight chill, succeeded by a flush of heat, but, to use his own words, he had " *no fever to speak of ;*" no sweating, and he was not ill above three quarters of an hour ; in former paroxysms, the cold fit alone lasted two or three hours, and the whole attack occupied five or six. Says he now feels uncommonly well. Appetite much improved. Took a laxative.

24th.—Slept well, had a slight sensation of cold this morning, but no fever or perspiration. Physic operated thrice.

25th.—Feels better and stronger. Slept well, but perspired copiously during the night. Appetite very good. Bowels regular. At the same hour this morning he experienced a slight sense of cold in his loins, but there was no general chilliness, and no heat followed.

" 26th.—Had another slight sense of cold at the same hour this morning,

but no heat or perspiration followed; strength and appetite improved; bowels regular; slept well.

"27th.—At the same time this morning was sensible of a feeling of lassitude, but no chilliness.

"August 3d.—Continues well. Discharged, to attend as an out-patient

"10th.—Came to hospital during the hour of visit in a very severe cold stage, which had been on him for about half an hour. He complained of intense pain of head, as if some one had been beating it with a hammer, accompanied with pulsation. The tremors were violent and universal; the surface rather cold, the extremities very cold; pulse 140, and oppressed; heat under the tongue 97°; breathing hurried and oppressed, and when he attempts to take in a full inspiration, by desire, he finds it not only impossible, but makes much complaint of a pain in the left side of the chest, in the region of the heart. A vein was opened, and before four ounces of blood were drawn, the rigor diminished in violence, and the pain of head became relieved; after the loss of eight ounces, the head was quite free from pain, and the tremors subsided; the heat of his extremities was restored, and a general warm glow was felt over the whole body. When eleven ounces of blood were abstracted, he was found to be free from complaint, and the arm was tied up. Heat under the tongue at this moment 107°, and the pulse beat 126, and very full. The bleeding occupied five minutes. In about ten minutes after the bleeding, the headache became so intense that he entreated to lose more blood, and eight ounces were taken with complete relief. This quantity was discharged in three minutes. His body was now universally warm, indeed rather hot; the additional blankets were removed, and he felt afterwards cool and comfortable. Pulse 120; feels drowsy.

"11th.—In an hour after the second bleeding yesterday, the headache returned, but in a much slighter degree; it was completely relieved by the application of cold water. Passed a good night, had a copious perspiration towards morning. Feels now quite well; has no pain, and says he does not feel weak. Appetite good. Had three stools last night, and one to-day.

"17th.—Has continued to improve since last report. Has had no return of the disease, and is discharged to attend for a few days as an out-patient.

"Case XIII.—John Loyd, aged 20.—Has been eleven months in the service, and was three times in hospital at Woolwich with intermittent fever.

"July 27, 1827.—By account, he had regular paroxysms of tertian intermittent lately on the voyage from Woolwich to Leith Fort. When he presented himself at the hospital to-day, his countenance was much oppressed, and his gait tottering. Says he has had a rigor all night on guard, and that he has felt cold for the last twenty-four hours. Complains much of headache, pain in the loins, general uneasiness, and difficulty in breathing. Heat under the tongue 100°; thermometer held in the hand 78°. The feet and legs also cold to the touch. Pulse scarcely to be felt, and not to be counted. He appears to be between the cold and hot stage, the cold predominating, with so much congestion about the heart and larger vessels that re-action is prevented. Upon this view of the case a vein was opened, and although a large orifice was made, the blood only trickled down the arm, which was proved to depend on a want of sufficient force in the circulation; for when the orifice was pressed by the finger, so as to stop the flow of blood for a moment, allowing time for the vein to fill, a stream took place on

the removal of the pressure; this was repeated a number of times, and with the same effect. The blood itself was thick, and coagulated imperfectly; it looked of different tints. Twelve ounces of blood were taken in fifteen minutes. The patient felt somewhat relieved after the bleeding, and complained of debility.

"28th.—Became very hot and restless in an hour after the bleeding, but has had no perspiration. Passed a bad restless night, with headache and sore throat. Pulse 106, distinct and easily compressible. Skin hot. Thermometer placed under the tongue 102°; held in the hand 99°. On looking into the throat, there appears to be no inflammation. Breathing almost natural. Is affected with slight startings. A vein was opened in the arm, and although a large orifice was made, the blood only trickled, and presented the same black appearance as yesterday; as soon as four ounces were taken, a small jet took place, which increased at last to a tolerable stream. The arm was tied up on the approach of syncope, when eight ounces were abstracted. Expressed himself much relieved by the bleeding, particularly with regard to his head. Heat under the tongue after bleeding 100°. Feels disposed to sleep.

"Vespere. Complains of headache, heat of skin, and considerable thirst. Pulse 100, and strong. Blood drawn in the morning has not separated any serum; it is like treacle, and, together with that taken at last bleeding, has all the appearance of what the old writers called "dissolved putrid blood."

"29th.—Feels better in every respect. Slept well. No stool since yesterday morning. Pulse 100, less oppressed. Heat natural. Tongue rather foul, and dry at the tip.

"30th.—Continues to feel better, and to sleep well, but complains of weakness. Three stools. Pulse 92, of good strength; great thirst.

"31st.—Complains of general uneasiness, sore throat and difficult deglutition; also of a pain in the epigastric region. He attributes these symptoms to the solution of the tartrate of antimony, which he has been taking for two or three days. The throat looks inflamed, the fauces and uvula being covered with a thick viscid exudation. Tongue dry, red round the edges and at the tip. Skin hot. Pulse 100. Thirst considerable. Bowels opened twice. Abdomen to be fomented. Antimony to be discontinued. A small dose of castor oil. Blister to the throat.

"August 1st.—Passed a bad night; but the restlessness and the troublesome symptoms described yesterday began to decline towards morning, and he now feels considerably better. Tongue moist, but discoloured and dry in the centre, and in a small angular space at the tip. Skin hot and dry; pulse 98; three stools; blister rose well, and relieved the throat.

"3d.—Slept well the last two nights; feels better in every respect; but complains of his tongue, which is fissured; it is cleaner and quite moist; thirst diminished; skin rather warm; one stool yesterday, and two to-day; pulse 80, of good strength; appetite improving.

"7th.—Convalescent; and able to sit up. He continued afterwards to make a good recovery.

"Case XIV.—John Boyd, aged 23. Was lately quartered at Woolwich, during a period of nine months, when intermittent prevailed, but he escaped the disease. Was seized last night, October 25, 1827, about twelve o'clock, after retiring to bed, with cold shivering, giddiness, and difficulty of breathing,

which continued for three hours with great severity, and then became mitigated, but did not entirely cease. In a few hours afterwards, the rigors with the other symptoms recurred with increased violence, and continued so until I visited him at ten o'clock on the morning of the 26th October. He had no sleep during the night. Was still shivering violently, and walked to the hospital with great difficulty from extreme weakness, and his gait was like that of a drunken man. After he was placed in one of the wards, the extremities were found to be cold; heat under the tongue 95°. Respirations 38, and performed with an effort. Pulse scarcely to be felt at the wrist, beating 65. He complains of an insupportable sense of coldness; of excruciating headache between the temples; difficulty of breathing; oppression at the chest, and debility. A vein was quickly opened; the blood did not flow readily at first, although the orifice was well made. When about five ounces of blood were abstracted, the respiration was performed with more ease, the pain of head was less, and the tremors were slighter. The blood now began to flow in a better stream, and when ten ounces were taken the patient declared he had no complaint, but giddiness and a sense of faintness. Hitherto he had been in the sitting posture, but was now placed in the recumbent, and the arm was tied up. The space of time occupied by the bleeding was two minutes and a half. The pulse was much stronger, beating 96. The thermometer placed under the tongue rose to 99. In the course of five minutes afterwards, a slight rigor supervened, with a return of the headache; and as the pulse was strong and firm, the blood was again allowed to flow from the same orifice to the extent of six ounces, with complete and permanent relief. He now felt "comfortable," to use his own expression. Pulse 80, of good strength. Had a drink of warm gruel, and in a short time a slight moisture appeared on the surface of the body.

"Vespere.—The patient was found sitting up dressed. Said he did not feel weak, and that he had been very comfortable since the bleeding. Surface moist. Pulse 80, strong.

"27th.—Passed a good night. Had some perspiration. A laxative powder which he took last night operated five times. The report on the 4th November states, that he feels quite well, and as strong as ever he did. Appetite good. Sleeps soundly. Bowels regular without medicine, and he has had no return of the disease since the bleeding, and on that day he was discharged the hospital.

"Case XV.—John Rose, aged 22. Was always healthy till he had the ague at Woolwich, for which he was in hospital twice, three weeks the first time, and a month the second; but says he has since scarcely ever been free from pain of head and loins.

"October 29th.—After having experienced several attacks since the 16th October, was seized with a paroxysm between two and three o'clock this morning. At ten he was still in the cold fit; he complained of pain in the head and loins. The tremors were not violent. Tongue rather loaded, but moist. Pulse 64, weak and oppressed. Heat under the tongue 92°; in the hand 72°. A vein was now opened, and he was quite relieved before six ounces were abstracted, and the tremors ceased when twelve ounces were taken, which occupied three minutes of time. The thermometer was now again placed under the tongue, and the heat found to be 96°; in the hand 75°. There had been no application of heat, nor had any warm drink been given. There was a slight moisture over

the surface. Upon being asked if he felt weaker since the bleeding, replied, that he is "not aware of feeling weaker."

"30th.—Was quite comfortable after the bleeding yesterday, so much so, that he dressed himself and sat up all the afternoon, and ate a good dinner. Slept well. Bowels open. Tongue clean. Pulse 64, and of good strength. Thinks he feels rather weaker than he did yesterday afternoon, but says he has no complaint.

"4th November.—Continues to improve in health. Has had no return of the disease, and was discharged the hospital in the course of a week cured, having used no medicines but laxatives.

"Case XVI.—Gunner James Anderson, aged 20. Has been four years a soldier. Served in the Mediterranean for eighteen months. Had several attacks of intermittent, for which he was taken into hospital in one of the Ionian Islands; and since his return to England had two different returns of the disease. He describes his sufferings to have been always very acute during each paroxysm. Has otherwise enjoyed good health. Appears to have a good constitution, and with the exception of a yellow tinge, looks healthy. He is stout, well made, and about five feet ten inches high. By trade a weaver. A native of Glasgow.

"3d April 1828.—Presented himself this morning at the hospital at Leith Fort, labouring under all the usual symptoms of inflammatory fever, and complaining much of pain in his head and loins. Thirst is urgent. Skin hot and dry. Pulse 130, full and hard. Hard cough. Stated that he had been attacked about day-light with severe cold shivering, which, after continuing for several hours, terminated in a state of heat and fever. In the course of a few hours after admission, perspiration came on, and the urgent symptoms gradually declined as usual.

"4th.—Passed an indifferent night. Complains of cough, with which he says he has become affected since his arrival at this station on the 12th March last; that it becomes much worse as soon as he begins to shiver. After the paroxysm is over, a slight expectoration takes place, which relieves the cough till the next attack.

"The paroxysm of yesterday was the fourth, with a day intervening between each. He is aware of the nature of the complaint, and says it is the same he had in the Ionian Islands and at Woolwich.

"Continued in the same state, having a severe paroxysm every third day till the end of the month, when he complained of more than the usual sufferings. His skin became of a bright yellow colour, and he was relieved by vomiting a large quantity of billous matter.

"The attacks still continued; they have anticipated the usual time by several hours, so that the different gentlemen who went to the hospital to bleed him in the cold stage, were either too soon or too late, and no one was fortunate enough to drop in at the time, till Mr Drever remained in the hospital all night, and he was then bled in the cold stage. The following account was written by that gentleman.

"'I was called at half past one A. M. May 10th, to see Anderson, soon after the commencement of the cold sensations. At two o'clock, after the rigors had been violent for about a quarter of an hour, I proceeded to bleed him. The

thermometer placed under the tongue stood at 95°. The pulse beat 130 and weak, so as to be counted with difficulty. A large opening was made in a vein, but the blood only trickled; being afraid that the opening had not been properly made, I tied up the opposite arm and made a good orifice in another vein, but the blood still only trickled; and as the rigors continued very violent, I gave him nearly a wine glassful of spirits; and in a minute or two, the blood spouted in a large stream, and thirty ounces were quickly evacuated, when vomiting and a tendency to syncope took place. The tremors had entirely ceased, and all the unpleasant sensations. The patient expressed, in strong terms, the ease which had so suddenly been produced. In five or six minutes after the arms were tied up, the tremors returned for a few minutes, and then entirely subsided. Pulse 100.

"'I visited him again at the end of six hours, when he told me he had slept very comfortably. Pulse 70. Upon being asked to state the extent of the relief he experienced from the bleeding, he told me that there was a load taken from his breast and head, and no painful feeling was left.'

"At two regular periods since the bleeding, he was conscious of feeling heavy and sleepy, but had no tendency to rigor, or even to feel cold, although the weather has been exceedingly changeable, and for the most part cold, the wind easterly. He has no kind of medicines but laxatives to keep the bowels comfortable.

"Case XVII.—Gunner Robert Young, aged 42. Was in hospital for several months during the winter, complaining of pain in the chest, cough, and copious expectoration, together with emaciation, prostration of strength, and heavy night sweats. For four or five weeks, the expectoration was bloody, and amounted on an average to about three gills a-day. His pulse was never under 100. The sound of respiration on the right side of the chest was deficient, while it was puerile in many parts of the left lung, and there was no *râle* to be heard any where. Contrary to expectation, he became much better under the use of considerable doses of the acetate of lead; and contro-irritation, produced by tartar-emetic ointment, on the surface of the chest. When his recovery was considerably advanced, and in order to give him the best possible chance, he was sent on furlough to his native place; and when there, was seized with intermittent fever, which induced him to return before his leave had expired.

"After having experienced many severe paroxysms, he was taken into hospital, at Leith Fort, and on Sunday the 18th May 1828, the following report was made.

"Felt the cold fit coming on at half-past twelve this forenoon. In a quarter of an hour the tremors were so violent as to shake the bed. From the commencement of the cold fit, he coughed incessantly, without expectoration, and complained of excessive coldness, together with pain in the head, chest, belly, and back. Heat of the room 65°. Thermometer placed under the tongue 90°; held in the hand it fell to 76°. Pulse 75, and very weak. After the rigors had continued with violence for ten or twelve minutes, a vein was opened. The first cup, which was filled in five minutes, held twelve ounces; by the time it was half filled, the pain had vanished from the head and chest, the cough had ceased entirely. When the cup was filled, he said the pain had now left the back, and that a very warm, pleasant sensation, was gradually spreading from his back over his bowels and breast. The second cup held between eight and nine ounces;

it was filled in two minutes. The blood flowed with more force, but not in so large a stream. The tremors gradually subsided, and all unpleasant sensations disappeared before the arm was tied up. The breathing was easy and natural. Heat under the tongue 93°. Pulse 92, of tolerable strength. There was no sense of sickness, or tendency to syncope. He was again visited in twenty minutes, and found quite comfortable. In the evening he continued quite well, but had a little heat of skin, which was found to be owing to the great number of blankets he still had upon him. Upon their removal the heat disappeared. As he had had free motions from his bowels through the course of the day, no medicine was ordered.

"Had a slight paroxysm on the 20th, and another on the 22d, after which quinine was exhibited, which appeared now to have the effect of preventing a recurrence of the disease, although it had been exhibited in vain, and in much larger doses, before the bleeding.

Case XVIII.—The following is the case of James Bennet, treated by Dr Alison in the clinical ward of the Royal Infirmary, which was the foundation of his lecture against bleeding in the cold stage, and whose objections and arguments were subsequently re-echoed in the Lancet of Saturday, April 7, 1827, in a communication signed "*Scotus*."

"James Bennet, aged 39, shoemaker, March 27.—Had severe rigors on Saturday 25th instant, accompanied by thirst, anorexia, and pain of head, which continued for more than an hour; were then succeeded by heat of skin, vertigo, lassitude, increase of thirst, and pain of head. These symptoms continued five or six hours, and then gradually subsided during copious sweating. Had a similar paroxysm on the 26th, and also a less severe one this morning. Complains at present of slight pain below the left false ribs, somewhat increased by pressure or coughing. Pulse 60, full. Respiration natural. Skin cool. Tongue clean and moist. No thirst. Appetite pretty good. Bowels open. Urine said to be high coloured. Lips somewhat swollen, with a slight vesicular eruption around the mouth. Has taken purgative medicines, and also a little of the arsenical solution, since yesterday. Took an opiate draught this morning when the rigors commenced, after which they continued only a few minutes. Has since had no pain of head; little heat of skin; less thirst, and no sweating. Had the intermittent fever more or less constantly for nine months whilst in Spain, fourteen years ago. Has recently returned from the West Indies, where he resided for the last six years. Lives in a house where several persons have been ill of continued fever.—Fowler's arsenical solution, ℥ i. Water, ℥ vi. Mix. Let him have ℥ss every sixth hour.

"28th.—Shivering commenced this morning at ten, which abated somewhat after taking the draught. At half-past ten was still shivering, less violently; with pain of back and head. Pulse 72, rather small. Sixteen ounces of blood were taken, slightly sizy, crassamentum not contracted. *The pains abated, and the shiverings immediatcly ceased.* Has headache now, and giddi-

ness. Pulse 72, full, soft; tongue furred, moist. No sweating since the shivering. Pain of the left side of abdomen only felt on coughing. No pain of back.—Continue the arsenical solution. Repeat the anodyne draught.

" 29th.—Began to sweat at two, which lasted several hours. Had griping and tenesmus with headache at night, which abated after the operation of a dose of castor oil. No shivering to-day. Four doses of the solution taken. Pulse 60. Tongue moist, slightly furred. Complains of weakness.—Continue all the medicines. Let him have lb. i. of beef tea, and one pint of porter.

" 30th.—Had a fit of rigors this morning about ten, and took his draught. The shivering was less violent, but lasted an hour. Pulse 80, full, soft. Heat was an hour ago 100°. Tongue slightly furred, with thirst. Complains of headache, pain of back and left side of abdomen. Bowels confined. —Let him have one oz. of castor oil; a saline draught now and then. Continue the others.

" 31st.—Much sweating yesterday after having had an enema at night without effect. No rigors to-day. Pulse 68. Tongue whitish.—Let him have ℥ ij. of Infusion. senna, with ℥ ij. of sulphate of magnesia.—Repeat the arsenical solution now every fourth hour.

" April 1st.—Bowels freely opened. Rigors commenced to-day at ten, but slightly. They have become more violent within these few minutes. Pulse 84, pretty full. Skin feels warm. Tongue rather dry. Has pain of left side of abdomen just now. He has just taken the anodyne draught.—Continue the arsenical solution. Give him a powder containing four grains of sulphate of quinine every six hours.

" 2d.—Shivering abated quickly after the opiate draught. Sweated much in the evening. Feels easy to-day. Left side of abdomen slightly tender. Bowels open. No nausea.—Repeat the powders of sulphate of quinine every fourth hour.

" 3d.—Four powders taken. No fit. Very little pain of side.—Continue the medicines.

" 4th.—Five powders taken. No fit. Two stools. Appetite good.—To have four ounces of steak to-day, and daily.

" 5th.—Had a very slight fit of rigors at four yesterday, succeeded by heat of skin; full, quick pulse, and sweating in the night; little headache, and no pain of side. Pulse and tongue natural. Bowels open.—Continue.

" 6th.—Shiverings have begun within these few minutes. Pulse 96. Has taken his draught. Hand rather cold. Bowels open.—Continue.

" 7th.—Shivering lasted an hour yesterday. Began to sweat soon after, and sweated all night. Complains of pain in the left lumbar region, with some tenderness; no distinct hardness.

" 8th.—Rigors commenced this morning a little after 9 o'clock, and lasted an hour, though he took an opiate draught containing forty drops of tincture of opium. Has sweated some already. Pulse 100, full. Complains of headache and pain of left side of abdomen. Tongue rather dry, with some thirst. No stool.—Let him take a bolus of compound powder of jalap directly. Apply the cupping glasses to the pained part of his left side, and abstract six ounces of blood. Continue the powders of sulphate of quinine. Let him have drink, acidulated with lemon juice, without syrup, *ad libitum*.

"9th.—Side easier since the cupping. Bolus operated. No headache to-day. Appetite good. Much sweating in the night.—Continue. Let him take a mixture containing ℥ i. of sulphuric acid with water.—Additional bread.

"16th.—Had some vomiting this morning, succeeded by rigors about 9 o'clock, which lasted three quarters of an hour, but were not violent. Pulse 64. Heat 99°. Sweated a little. No headache or pain of side. Bowels slow.—Let him take ℥ ij. of infusion of senna, with ℥ ii. of sulphate of magnesia, directly. Continue the others.

"17th.—Had a second fit of rigors yesterday at 2 o'clock, which lasted long, although he took forty drops of tincture of opium. Sweated all night. Is free from complaint to-day, but weak. Bowels open.—Continue the powders of sulphate of quinine every third hour.

"18th.—No return of shivering. Has a little pain of left side of abdomen, on motion or coughing. Pulse natural. Appetite good. One scanty stool.—Give him directly a powder containing g^r xv. of rhubarb, and g^r iii. of calomel.

"27th.—Complains of feeling weakness of loins.—Apply a warm plaster to the lumbar regions.

"29th.—Bowels slow, otherwise well.—Let him have immediately a cathartic draught. Continue the others.

"30th.—Has complained of nausea and weakness, but without any shivering. Pulse natural. Tongue whitish.—Let him take ℥ i. of a mixture containing ℥ ij. of ammoniated tincture of valerian, in ℥ vi. of mint water. Continue the others.

"May 1st.—Feeling of nausea and headache abated. Bowels regular.—Let him have one ounce of bark, also a warm plaster for the loins. Dismissed cured.

Second attack.

"Admitted 25th May.—On the morning of 17th instant, was taken ill with headache, languor, and pain of back, succeeded by slight rigor, which continued for about a quarter of an hour, when it was followed by heat and sweating. Has had an interval of seven days without a return of paroxysm, which re-appeared on the 24th with increased severity, the rigor having been much more violent, and of longer duration, accompanied with much nausea, excruciating headache, and those various symptoms which characterise the invasion of intermittent fever, under an aggravated form. Has had this morning, previous to admission, another paroxysm, which was an hour earlier in the period of its accession, and continued, including its three stages, for about six hours, during the first of which he had much vomiting. Complains most at present of headache, prostration of strength, general lassitude, and soreness of limbs. Has no pectoral or abdominal symptoms; thirst is urgent; no anorexia; pulse 66, full, but soft; respirations 26 in the minute; tongue furred, but moist; bowels open; skin warm, rather pungent, and bathed in perspiration; face swollen; urine copious. Has been lately a patient in this clinical ward, afflicted with his present complaint, of which he was dismissed cured, on the 30th ultimo. The history of the present case

derives much additional interest from the circumstance of two of his children having been also recently attacked with ague, for which one of them is now a patient in the Infirmary.—Let him have g^r iij. of sulphate of quinine three times a-day, and two colocynth pills to-night.

" 26th.—Three stools from the pills. No shivering since admission. Headache still severe. Pulse 66, full. Pain of back and limbs preventing sleep. No pain of side or of abdomen.—Apply the cupping instrument to his temples, and abstract eight ounces of blood.—Continue the powders.

" 27th.—Headache relieved by cupping. Had a severe shivering fit this morning, reported to have lasted two hours, and is now sweating profusely. Pulse 66, full. No pain of abdomen or side. Two stools.—Let him have the powders of sulphate of quinine every third hour. Also an anodyne draught, with forty drops of tincture of opium, at the commencement of the paroxysm.

" 28th.—Pulse 66. Feels chilly. Bowels open.—Continue powders of sulphate of quinine.

" 29th.—Had a shivering fit lasting an hour and a half, commencing at nine. Has sweated much. Pulse 66, full. Complains of general soreness. Bowels open. Had nausea, no vomiting.—Let him have an effervescing saline draught every hour. Continue the powders.

" 30th.—Pulse natural. No pain to-day. Appetite pretty good. Five powders taken.—To have four ounces of steak and a pint of porter.

" 31st.—Took six grains of sulphate of quinine this morning at half-past eight. Shivering came on at nine, and lasted about half an hour, but was much slighter. No sweating since. No headache, but complains of nausea and giddiness. Bowels open.—Let him have the effervescing saline draught now and then. Continue the powders. To have ordinary diet to-day, but the steak to be repeated to-morrow.

" June 2d.—Took a double dose of quinine again this morning at half-past eight. Has had a little chilliness; no rigor.—Continue the powders.

" 3d.—Began to shiver directly after visit yesterday. Took five grains of sulphate of quinine, after which it went off. Sweated much. Has complained much of *tinnitus aurium* and giddiness since yesterday afternoon. Two stools from pills taken last night. Pulse 68, full. Tongue whitish.—Repeat the powders every fourth hour; and the laxative pills at bed-time.

" 4th.—No shivering to-day. Much less *tinnitus*. Bowels open.—Continue the powders and pills.

" 5th.—Five powders taken. No vertigo or *tinnitus*. Appetite good.—To have additional allowance of bread.

" 6th.—Had chilliness; no rigors. Six powders taken. Bowels slow. No pain.—Let him take two colocynth pills immediately. Continue the powders.

" 7th.—No return of shivering. Complains only of pain of back.—Apply a warm plaster to the lumbar region. Continue the medicines.

" 8th.—Bowels slow. Feels drowsy to-day. No shivering.—Let him have the colocynth pills. Continue powders.

" 13th.—Bowels slow.—Let him take a cathartic draught.

" 15th.—Two laxative pills at bed-time.

" 17th.—Inflammation of eyes, particularly of right, with adhesion of eyelids in morning. No headache.—Let him have ℥ i. of compound powder of jalap immediately. To bathe his eyes frequently with tepid water, and to apply simple ointment to the edges of the eyelids.

" 18th.—More inflammation of right eye.—Apply the cupping instrument to his temples. Repeat the powder of sulphate of quinine three times a-day.

" 20th.—Eyes still sore.—Apply eight leeches round the eyes.

" 21st.—Two leeches only fixed. Bowels confined. Inflammation of eyes somewhat abated.—Repeat the leeches and purgative draught.

" 22d.—Leeches bled well. Eyes less painful. Still inflamed, with discharge of tears.—Dissolve gr xv. of the acetate of lead, in ℥ viij. of water, for a collyrium.

" 24th.—Both eyes somewhat inflamed, with impatience of light, and dimness of sight.—Abstract from the arm ℥ x. of blood. Continue medicines.

" 25th.—Eyes better. Bowels open.—Continue the lotion for the eyes.

" 26th.—Still some pain of eye-balls; less inflammation, but has some dimness of sight. No pain of head. Iris moves well.—Discontinue the powders of the sulphate of quinine. Apply a blister to the nape of neck.

" 30th.—Still some dimness of sight.—Let him have ℥ i. of simple ointment.—Dismissed cured.

" Case XIX.—A. B. a carpenter in Leith, had had many severe attacks of intermittent, which weakened him so much that he was almost entirely confined to bed. He had taken a great many remedies, but the disease increased in severity. Several of my pupils watched this patient in order to bleed him in the cold stage; at length the rigor came on, and blood was drawn to the amount of sixteen or seventeen ounces, stopping the paroxysm. He experienced the same sudden relief that all the others had done from pain in head and loins, great oppression at the præcordia, dreadful sensation of coldness. This man, however, had two returns of the disease, which were owing to constant perspirations, which he encouraged, and also from allowing his bowels to get very much out of order. After a few doses of laxative medicine, and insisting on his avoiding the perspirations, he had no return of the disease, and soon recovered his ordinary state of health without any other means.

" Case XX.—James Donachie, æt. 35, pale and emaciated, applied at the Dispensary on the 10th May 1828. States that he was at work in Lincolnshire last harvest, where he became affected with a quotidian intermittent, which continued to recur about five, six, or seven o'clock in the evening, till February last, except during his stay in the York Infirmary, and a short time afterwards. He became a patient in the Infirmary of Edinburgh, in the clinical ward. He further states, that whilst there, the symptoms ran so high, that he was bled in the hot stage, but without relief. He remained in the hospital four weeks, was treated with bark, and discharged; but was affected as severely as ever. Since about March 22, when he came out of the Infirmary, the fits have continued to attack him every evening at five, six, or seven o'clock, occasionally continuing until the morning. A considerable part of this time he was under the use of Fowler's solution, without the least

relief. Mr Taylor, one of my pupils, bled him during the cold stage. Before the bleeding, his pulse was 63; the rigor was completely formed. Although the vein was properly opened, no blood came at first; it soon dropped down the side of the arm, and afterwards came in a jet, when the rigor instantly ceased, and the bleeding was stopped. One ounce and a half of blood was abstracted. He got a little calomel and rhubarb to keep his bowels open. His strength now increased rapidly, and he had no attack for six days, till the 16th May. During this interval he felt tolerably well, and only experienced a slight sense of chillness and disposition to yawn, for a short time, instead of the regular paroxysm, and not every day, as before, but on alternate days, and at 1 P. M. instead of the evening. This last attack came on, as already mentioned, on Friday 16th May, while he was out taking a walk on the Castle Hill, during which he was exposed to a keen north-east wind, which prevailed at the time. He got home with great difficulty. He had another attack on Sunday 18th, which, together with the former one, he describes as having been attended with a less severe cold stage, but more intense hot and sweating stages, than he had before experienced. 19th, Complains of thirst, but no loss of appetite; surface pale; tongue white and moist; pulse 60, soft and compressible; bowels regular, has no uneasiness.

"Tuesday 20th.—Had no fit, but only a disposition to stretch and yawn, with a slight coolness of the surface; in a few minutes afterwards his skin became hot, attended with moisture on the breast and on the inside of the fore arms; pulse 80, soft.

"Wednesday 21st.—He had sweating yesterday afternoon after the visit; has no complaint to-day.

"Thursday 22d.—No paroxysm, but experienced the yawning and stretching, followed by heat and sweating.

"Saturday 24th.—Escaped, and had even no threatenings till

"Wednesday 28th, when there was slight chillness, succeeded by heat and sweating. He had another slight attack on Friday 30th, but both these attacks were again owing to exposing himself out of doors in cold damp weather.

"On June 2d, had a return of the stretching; yawning; heat; and sweating, which continued all night; indeed every night he perspires profusely, which is not to be wondered at, when it is known that he slept with four other people in a low room, eleven feet by twelve. After this he had no paroxysm, and the only remedies which were given were the decoction of quassia, sulphuric acid, and gentle laxatives; and he went to work on 26th June, as a labourer, with restored health and strength.

"Case XXI.—Francis Trail, æt. 26, presented himself at the Dispensary early in the beginning of May 1828, in a pale and very weak condition, with swollen features, when he gave the following account of himself: He is a native of Ireland, and went to work at the harvest in Lincolnshire in 1827; remained there about a fortnight; at that time he was in the enjoyment of good health, and continued so till the beginning of last January, when he began to feel unwell at times, but still was able to continue at his work on the rail-road, near Dalkeith. About the end of February he was seized with violent shivering, which was succeeded by great heat, and terminated in profuse perspiration; the paroxysms have continued ever since in the tertian

form, and he has been unfit to do any thing, his health and strength becoming very much impaired. He was bled early in the disease, in the hot stage, without any remission of his sufferings, and without preventing the accession of the regular paroxysms. The cold stage generally continued from half an hour to three quarters, and he experienced great suffering from pain in the head, and lumbar region, with sickness. On Sunday, 10th May, he was bled to 16 oz. during the cold stage. During the bleeding the rigors ceased, but afterwards a hot stage took place, accompanied with pain in the head and loins.

"On Tuesday the 12th, as he felt light and easy, and better than he had done for a long time, he walked a few miles out of town to see some friends, when he had a paroxysm, but which was not so severe as on former occasions. On Thursday he had another paroxysm, which was slight, unattended by rigors. After this period he had no cold stage, instead of which, he felt languor, headache, sickness, and pain in the lumbar region in a slight degree; he recovered his health and strength rapidly, and in about a fortnight from the time of the bleeding had no complaint. He stated that his appetite was now good, his strength daily improving, and at the end of May he returned to his work cured.

"Case XXII.—Dr Cambridge, 29th September 1827, had repeated attacks of intermittent fever at Ostend some time ago, at which place it was prevalent at the time. Since his arrival in Edinburgh, three weeks ago, he has had a daily paroxysm, and used the sulphate of quinine, without effect. His appearance is far from being emaciated, but he looks pale and weakly.

"The rigor came on severely at nine this morning, accompanied by insupportable pain of head, shooting from temple to temple, inability to take a full inspiration, with sense of tightness across the chest. The rigors continued for the space of three hours, and then ceased; but the sense of extreme coldness, and other severe symptoms, continued. I was called to see Dr Cambridge, and made my first visit at one o'clock, when his sufferings were still unmitigated. He still felt cold. His pulse was weak and oppressed, 130 in the minute; respiration 55; face pale, and features contracted; tongue loaded, but moist. A vein was opened; immediately after the blood began to flow, he expressed in strong terms his sense of the sudden relief he experienced; at the expiration of a minute he could dilate his lungs to the fullest extent. Eighteen ounces of blood were taken, which occupied three minutes of time; and before the arm was bound up, all his uneasiness had ceased; the painful sensation of cold changed to that of a pleasant glow of heat, and the surface of the body was covered with a gentle moisture. No debility followed, and he was able to walk through the room. A brisk laxative was ordered.

"30th.—Had no heat of skin yesterday after the bleeding. His feelings were comfortable during the remainder of the day: he passed an excellent night, and felt quite well this morning up to the moment of attack. The paroxysm came on at eleven A. M., and although he shivered smartly, yet he distinctly declared that he was quite free from the cerebral symptoms, and some of the other very painful feelings, which had distressed him on former occasions, excepting the tightness and oppression at the chest. Respirations 36 in the

minute. Pulse weak and not to be counted. Mouth slightly ulcerated, and complains of a bad taste. Tongue loaded, brown in the centre, and rather dry. Had four large, dark coloured, and fetid evacuations since last night, which produced a burning sensation at the extremity of the rectum. A vein was opened, and blood was drawn, to the extent of ten ounces, which occupied four minutes of time; before five ounces were abstracted, he described, in language most poetical, his relief, which was as sudden as it was perfect. The pulse was reduced in frequency, and became much stronger, and he said he was sensible of an increase of strength; indeed, he was able to walk through the room immediately without support. In about an hour after I took my leave, the rigors returned with considerable severity, but unattended by headache, and there was little oppression in the chest. He had some fever, and a sweating stage. The sulphate of quinine was again had recourse to, and he had only one other slight paroxysm. His health afterwards improved daily, and was soon perfectly re-established.

"Case XXIII.—Dr Cambridge informed the Author, that after reading his first paper on bleeding in the cold stage of intermittents, which he met with on the Continent, he had an opportunity of saving the life of a clergyman, upon whom he tried the practice, with complete success. This gentleman's health was reduced to the lowest possible ebb, by repeated attacks of intermittent fever. He had tried bark in all its forms, and quassia and arsenic, without the least mitigation. Dr Cambridge bled him in the cold stage, and he had no return of the disease, and his health was quickly re-established.

I have been favoured with the following case of *coma*, occurring in the cold stage, treated successfully by bleeding, by Dr Henry Lucas of the Royal Artillery, in the Royal Ordnance Hospital at Woolwich.

"Case XXIV.—Gunner William Smith, 9th Battalion, Royal Artillery. Admitted, August 16. 1827. Is perfectly insensible; eyes fixed, pupil partially contractile; respiration slow and deep; pulse full and slow; skin cool, especially about the lower extremities. Is completely insensible to external stimuli. Was brought from one of the guard-rooms, where he had been complaining of feeling ill. Had lately had attacks of ague. A vein was opened in the arm, and he recovered sense and motion on losing six ounces of blood. He complained of cold, though by that time the skin was warmer. Twelve ounces of blood were taken. Warm bottles were applied to the feet; cold lotion to the head; and a turpentine enema. In the evening he was found sweating. Bowels not free.—Cathartic mixture ordered.

"17th.—Bowels moved once by the mixture. Pulse soft and full. Skin moist and warm. Tongue rather loaded.—Repeat carthartic mixture.

"18th.—Had distinct rigors last night, succeeded by increased heat of surface and sweating. He was discharged on the 24th, cured.

"Cases XXV. and XXVI.—The following extract is taken from a letter from

the late Mr Brown, assistant surgeon in the 52d Regiment, dated Jersey, 8th August 1827: 'Since I had the pleasure of hearing you lecture, I have, in three instances, tried the effect of bleeding in the cold stage of intermittents, and twice with complete success. The patients were invalids, sent from Gibraltar for change of climate. One had had ague for eighteen months previous to his coming under my care; and at the time he left the depôt for Chatham, seven weeks from his being in hospital, he had no recurrence of fever. In the third case I was not so successful; it was, I think, from the bungling manner in which I opened the vein, I could not get the blood to flow.'

"Cases XXVII. XXVIII. XXIX. and XXX.

"*Cork, Marlborough Street,*

"Sir, *Wednesday, Nov.* 14. 1827.

"The perusal of your paper upon the utility of blood-letting in the cold stage of intermittent fevers, induced me to resort to that remedy, in the only four cases of the disease which I have met with since. The disease is of comparatively rare occurrence in this city, and never assumes a very aggravated form. Three of the cases I allude to were stout labouring men; the fourth was a delicate girl about twelve years of age. None of them presented very dangerous symptoms. The most distressing symptom was severe pain in the head, which was generally most intense during the cold fit. The loss of blood, so far from causing collapse, or adding in any degree to the feeling of debility which existed, seemed to produce quite an opposite effect. The patients expressed themselves immediately relieved, a gentle perspiration ensued, and they appeared as if revived by the influence of a generous cordial. The bleeding, however, did not effect a cure, but the subsequent attacks were infinitely more mild, and yielded in a short time to the exhibition of the arseniate of potass.

"The beneficial effects of this practice fully answered the expectations which you announce; and I have no hesitation in saying, as far as I can judge from limited experience, that we are indebted to your sagacity for a bold and unusually successful innovation in the treatment of a disease, which has constantly baffled our best directed efforts. You will excuse this brief communication, but I am aware that no reward is more grateful to a physician, than the assurance that his suggestions have received and merited the approval of his brethren.———I am, Sir,

With much respect,

Your obedient Servant,

To Dr Mackintosh. (Signed) D. B. Bullen, M. D."

"Sir,—In consequence of having read, with great interest, your valuable paper upon the subject of bleeding in the cold stage of intermittent fever, which was published in the Edinburgh Medical and Surgical Journal for April last, I resolved to adopt your plan of treatment, in the first cases of ague which should occur to me. Ague has not for many years been endemic in this neighbourhood, so that the opportunities I may have of further trials of your treatment will probably not be numerous. The results of the two cases, of which I take the liberty of sending you an account, are very favourable. They occurred to me in my practice as physician to the General

Infirmary here. With a strong conviction that future experience will confirm the correctness of your views and practice, and with feelings of admiration and esteem for an individual, who has improved the practice of medicine, by a disregard to long established prejudices, and erroneous doctrines, I remain, Sir,

Your obedient Servant,

Worcester, July 27. 1827. JONAS MALDEN, M. D.

To Dr Mackintosh, Edinburgh."

" Case XXXI.—May 5. 1827.—Priscilla Williams, æt. 30. Complains of pain in the head. Skin hot. Tongue furred. Pulse 120, small and rather hard. Pain in the epigastric region, with loss of appetite. Bowels confined. Has a severe rigor every other morning of half an hour's continuance, which is followed by a hot and sweating stage. Her complaints began with cold shivering, three weeks ago, in the neighbourhood of Oxford, where ague was prevailing.—Applicentur hirudines xii. regioni epigastricæ.—R. Extracti colocynth. co. g^r. xv.—Hydrarg. submuriatis g^r. iii.—Fiant pilulæ tres stat. sumendæ.—R. Liq. antimon. tart. ℳ. xx. Potassæ nitratis g^r. x. Mist.—Salinæ ℥ i. M. Sumat quartis horis.

" 6th.—Pain in the stomach relieved. Headache continues. Bowels freely opened. No rigor yesterday.—Let her be bled during the cold stage to-day.

" 7th.—Lost ten ounces of blood yesterday during the rigor, when she became rather faint. A hot and sweating stage succeeded. Bowels open. Tongue cleaner.

" 8th.—Pulse 80, and of moderate strength. Headache and pain in the stomach much better. The rigor came on this morning, during which she was bled to sixteen ounces, and a slight hot and sweating stage succeeded.

" 9th.—Another very short and slight rigor this morning.

" 10th.—Ague returned to-day, but bleeding cut short the cold stage, which was neither followed by heat nor sweating.

" 13th.—Pulse 72. Tongue clean. Appetite good. Free from pain. Has had no ague since last report. Wishes to leave the hospital. Discharged.

" 27th.—I saw the husband of this woman, who told me his wife was quite well, and had no return of her disorder.

" Case XXXII.—May 22. 1827.—William Holland, æt. 24. Has pain in the head and limbs, with furred and dry tongue. Pulse 96, small. Bowels regular. Has severe rigors of an hour's duration every day, which are followed by the hot and sweating stages. He has great prostration of strength, and a sallow countenance, and is much emaciated. Illness began with a shivering ten weeks ago. He has for some time been wandering about the country, and sleeping in the open air at night.—R. Hydrarg. submuriatis g^r. iv. Pulveris jalapæ g^r. viii.—M. f. bolus stat. sumend.

" 23d.—Had a rigor yesterday which lasted an hour, and was succeeded by a hot stage and profuse sweating. The pulse in the rigor was 120, and very small. The bowels have been freely opened; stools of a good colour. Headache continues.—Fiat venæsectio dum rigor adsit.

" 24th.—Was bled to fourteen ounces during the cold fit yesterday.

Whilst the blood was flowing, the shivering diminished. The hot stage followed, but lasted a much shorter time than usual. The pulse was not perceptibly affected by the bleeding.—Sumat mistura cathartica ℥ iss pro re nata.

"25th.—Is much improved in appearance. Pulse 80, soft. The rigor came on at the accustomed time yesterday, but the shivering was less violent. Venæsection was repeated during the paroxysm. The blood flowed freely, and the rigor ceased immediately upon tying up the arm. The cold fit lasted twenty minutes. The pulse during the rigor was 120. No hot fit followed.

"26th.—Had a slight tremor yesterday, which lasted an hour. The hot stage afterwards was scarcely perceptible. Bowels open. Tongue much improved. Pulse natural.—R. Sulphatis quininæ gr. ii. Infusi rosæ ℥ i. M. —Sumat secundâ quâque horâ.

"27th.—Had a short and slight shivering yesterday afternoon. No hot stage. Another at two o'clock A. M.

"29th.—No return of the ague since last report. Pulse 72. Bowels regular. Tongue clean. He makes no complaint.

"June 2d.—Continues well. From this time till the 14th he had no return of the complaint. He had regained flesh and a healthy appearance, and was discharged cured."

The practice of bleeding in the cold stage has also been successfully tried by Dr Haviland, Professor of the practice of physic in the University of Cambridge, the result of which was communicated to me, with Dr Haviland's permission, by Dr W. H. Yates. The following are extracts from Dr Yates' letter: "Dr Haviland tells me, that in consequence of your communication to the profession on the propriety of bleeding in the cold stage of fever, he was disposed to make trial of it, having, as you would expect, frequent opportunities in these low countries. His principal object was in the first place to ascertain how far it was practicable; for when he read the account, it struck him that it was a practice quite consonant with his own views. He was always assured that in these cases there existed considerable congestion of the larger vessels, and that, could a portion of their contents be *safely* removed, the general result would be good. He has since tried it in several cases with decidedly beneficial effects."

The following clinical report on the success of bleeding in the cold stage of intermittents in India, was read by Mr Twining at a Meeting of the Medical Society at Calcutta, on 5th December 1829.

This report comprehends ten cases.

"Case I.—Was bled to 12 oz. in the cold stage of the 6th paroxysm of tertian intermittent. He experienced immediate relief, the rigors ceased, and he became hot for about half an hour; he had a slight return of fever daily at noon for six days, not preceded by rigor or cold. This patient had enlarged spleen.

" Case II.—Was bled to 14 oz. in the cold stage of tertian ague in the 4th paroxysm. The rigors soon ceased, he had a slight hot stage for about half an hour, and there was no return of the disease.

" Case III.—Was treated with purgatives, quinine and arsenic, afterwards with mercury to salivation, without benefit; bled in the cold stage of the 11th paroxysm, he felt immediate relief, and had a very short and slight paroxysm without sweating stage. A slight feverishness remained for eight days after. At the end of 14 days, he had a return of ague, and on the return of next paroxysm, after one day's interval, he was bled in the cold stage, and cured.

" Case IV.—Quotidian ague of seven days' duration, purged and took bark, bled to 18 oz. in cold stage of 7th paroxysm with great relief; was exposed to cold next night, and had continued fever afterwards.

" Case V.—Tertian ague, bled to lb. i. in the cold stage of the 5th paroxysm, with immediate relief; had a short and slight paroxysm, and was cured.

" Case VI.—A most distressing tertian, with very severe rigors; bled to lb. i. in the cold stage, and cured.

" Case VII.—Irregular ague, sometimes tertian, sometimes quotidian, bled to 12 oz. in cold stage, with much benefit; he was cured, having in place of ague on the two next days of expected access, a slight feverishness.

" Case VIII.—An Asiatic, native of Madras, bled to 6½ oz. in the cold stage of 2d paroxysm of tertian. The rigors ceased in less than two minutes after the vein was opened; he had no fever, and was cured.

" Case IX.—Irregular intermittent, used quinine without benefit, emaciated, bled to oz. vi. in cold stage, with immediate benefit, and had no return of the disease.

" Case X.—Bled to lb. i. in the cold stage of 6th paroxysm, the cold ceased, and he had a slight paroxysm. The ague returned on its regular day, and he was bled again to oz. x. in the cold stage, which was arrested, and had no ague or fever since."

In Mr Twining's second communication, read at a Meeting of the Society at Calcutta, on the 1st May 1830, the following additional cases were brought forward. The next six cases are numbered in continuation from the former paper.

" Case XI.—Quotidian ague of five weeks' duration; the subject a woman ten years in India. Spleen tumid; had used purgatives and quinine without benefit; V. S. to oz. xiv. in the rigor on 18th December. Rigors ceased in

6½ minutes, and she had no return of the disease after V. S. Purgatives used for several days.

" Case XII.—A Mahomedan had eleven paroxysms of tertian; treated with purgatives and quinine ineffectually. V. S. to oz. 3. in rigor on 27th December 1829. Rigor ceased in eight minutes, and he had no return of the disease.

" Case XIII.—Irregular ague in a European, from 16th Oct. to 25th Dec. V. S. in cold stage procured immediate and great relief. Had a paroxysm on 27th Dec. V. S. ad oz. 17. Rigor ceased while blood was flowing. Cured—no return of ague afterwards.

" Case XIV.—Intermittent (at first quotidian, afterwards tertian,) of twenty days' duration. V. S. to oz. 9. which shortened the cold fit, and there was no fever or sweating stage. Ague returned on 1st January. V. S. in rigor, to oz. 8. Rigor ceased in 10½ minutes. There was no fever, and very little sweating afterwards. Return of ague again on 3d January, but he did not call any one in time to bleed him. He had no return of ague after 3d January.

" Case XV.—Tertian ague of three months' duration in an emaciated subject. Cold stage very distressing, with headaches and vomiting. Had tried quinine, purges, and other remedies, with no benefit. V. S. to oz. xii. at beginning of rigor. The cold fit ceased in ten minutes, and all distressing symptoms were quickly relieved. This patient left Calcutta next day, and, as was afterwards understood, had ague on the regular day, but the medical man present refused to bleed in the cold stage.

" Case XVI.—An emaciated European, twenty-four years in India, had tertian ague for three weeks, and irregular ague for two weeks before. Rigors usually lasted three hours. V. S. to oz. x. on 10th January, after rigor had lasted nearly two hours; the shivering soon ceased. Slight heat, and no sweating stage followed. Paroxysm returned on 12th January, at half-past 9, and he was bled immediately to oz. ix. Shivering ceased in eleven minutes; little fever, and no sweating followed. The ague did not return. He had a slight feverishness at 10 A. M. on 15th. Purgatives were used. No relapse.

" The four next cases were Europeans, treated by Dr M'Andrew, Surgeon H. M. 14th Foot, who has tried the treatment now described in many other patients, and has not found one in whom V. S. at the beginning of the rigor has failed to effect a cure; he has usually given three or four purges, and says he is so well satisfied with the cures, that in future he will use no other treatment. One of his patients, whose case is detailed, was cured by the first V. S. Three others required a second bleeding each.

" Six cases were furnished by Dr Berwick, Assistant Surgeon at Beerbhoom:—the patients natives of Bengal. Dr B. observes, that natives of

India may be bled more freely and with more benefit than most people suppose: he has been somewhat disappointed with quinine as a remedy for the intermittents at Beerbhoom. Four of his patients required each only once V. S.; the two others had each a second bleeding; all used purgatives.

"Five cases treated by Dr Mackenzie, in Arracan, were Asiatics. One bleeding each was sufficient to cure four of his cases; the fifth experienced great and immediate relief, and felt so well that he walked home, a long distance: had a return of the paroxysm at night, and has been affected with irregular ague since; but living at a distance, has not been seen in time to repeat the bleeding.

"Four cases were treated by Mr Bacon, Assistant Surgeon. The patients were Europeans, and he was well satisfied with the treatment. Two of his patients were cured by the first bleeding, and two others by the second.

"Four cases were treated by Mr Kent, Assistant Surgeon, Bengal Service, who has a very high opinion of the efficacy of V. S. in the cold stage of intermittents. The whole of his patients were cured, each by one bleeding, in the cold stage. One of them was first bled in the hot stage, without much benefit: on the next paroxysm, V. S. during the rigor was resorted to, and cured the patient. Mr Kent administered purgatives, according as the condition of each patient required.

"The next four cases were sent by Dr Brown, Bengal Service, who has a favourable opinion of the treatment. Each of his patients required only one bleeding; two of them used also quinine, and all of them purgatives.

"Two other cases were supplied by Dr French, Surgeon H. M. 49th Regt. He likewise thinks favourably of the practice, and means to try it farther; but declines giving a decided opinion on such limited experience. One of his patients had the rigor cut short and the disease cured by a single bleeding; the other was bled twice, purged freely, and took quinine; the effect of V. S. on the existing paroxysm being very decisive, and affording immediate relief.

"Thus, (Mr Twining observes,) the practice of eight medical men, at different stations, shews that V. S. in the cold stage of intermittents has been successful with Hindoos and Mahomedans, as well as Europeans; and of the latter several were persons many years resident in India. *Some of them were of delicate constitution, and in emaciated condition. In many of the patients, quinine and various other remedies had failed for a long time.* The early stage of rigor appears to be the best time to take blood; but bleeding in *anticipation* of rigor does not seem to be of any benefit. Mr T. concludes by stating, that V. S. at the commencement of rigor appears to be fully as efficacious, and as deserving of confidence, as Dr Mackintosh has represented; and his experience up to this time entirely corroborates Dr M.'s good opinion of the treatment."

The fifth volume of the Calcutta Medical and Physical Transactions has been published since the above cases and remarks were quoted in the former edition of this work. It contains three additional papers, shewing the beneficial

effects of V. S. in the cold stage of intermittents, in different parts of India.

Dr H. Mackenzie, in a paper read before the Society on 7th June 1831, states that—

"In cases of irregular fever, and where the cold stage is not distinctly marked by rigors, for reasons before alluded to, I have not had sufficient experience to speak with confidence. But it would argue an unnatural distrust in the evidence of my senses, and an extraordinary want of interest in the improvement of our profession, if, under existing circumstances, I remained insensible to the beneficial effects of the remedy in question; and it would show a deficiency in the respect due to my professional brethren, if I refrained from laying before the Society, the proofs I have witnessed of the advantage and perfect safety of a judicious use of the lancet, in the commencement of the cold stage of intermittents.

"A gentleman, (Mr Twining,) to whom the Medical Profession, and the Medical and Physical Society in particular, is greatly indebted, has already furnished so many cases, that it may be unnecessary to take up time by particularising any more. I beg, therefore, to offer merely an abstract of my usual practice in intermittents, with its general results: and this, I trust, will be received with that spirit of lenient consideration and kindness, which a person unaccustomed and unwilling to obtrude his observations would solicit and expect.

"It may be proper here to state, that in almost every case, previous to using the lancet, I have thought it right to exhibit a smart dose of calomel and jalap, which was repeated daily, until the patient's tongue appeared clean; or at least until it has felt soft, and until the contents of the bowels have been well cleared out. When the lancet is used, the vein should be so opened, as to permit the blood to flow *pleno rivo;* afterwards, moderate doses of calomel and jalap, if required: or the Pil. Rhei Comp. of the Edinburgh Pharmacopœia is usually given at bed-time. In this way, in general, no quinine is given; but if absolutely required, there is nothing incompatible with the other remedies, in its exhibition as a powerful adjuvant in the usual manner.

"From the arm of a Seapoy, who had been daily suffering severe paroxysms of intermittent fever, I took about four ounces of blood in a full stream. In less than five minutes, to his apparently great surprise, and to that of his comrades, who seemed quite astonished at the sudden change, he declared himself perfectly well. He had not the slightest return of fever for more than six months that he subsequently remained under my charge. I had another case, very similar to the above, where five and a half ounces of blood sufficed; and several cases, at least a dozen, where the loss of from four to seven ounces of blood, though it did not completely cut short the existing paroxysm, certainly relieved it, and prevented any return of fever while the patients remained in the hospital. Some patients in whom the paroxysm has been arrested by bleeding, have felt themselves slightly heated, and uneasy, for a short time, at the hour and day the fever might otherwise have been expected to return; but these feelings have entirely gone off in the course of a few days, without any other medicine than a warm stomachic laxative. Others have had distinct returns of fever, for two, or perhaps three days; the paroxysms becoming more indistinct, and soon ceasing

altogether, with precisely the same treatment; while a few have been bled a second or third time, and cured.

"A stout European officer, had been long troubled with fever, but no distinct rigors. By great attention to his stomach and bowels, he was for a considerable time enabled to keep off the fever, excepting about the lunar periods; but it so happened that he never could be seen in time to try the effects of V. S. just as the fever began, with any thing like a fair chance of its success. He acknowledged that his greatest relief arose from attending to the state of his digestive organs; he usually took calomel and jalap four days before the expected period of attack: and he always suffered most, when by neglect, or from the interference of urgent public duties, he was obliged to take a purgative on the day of the expected paroxysm. In this way, by the judicious use of calomel, jalap, sulphate of magnesia, and the compound rhubarb pill, he for a long time precluded the necessity of taking any quinine, although he had previously been obliged to take such quantities as to cause a feeling of great uneasiness in the temples, and much disturbance in the head. He is sure to suffer from any extra fatigue, or exposure, and when any circumstance prevents his usual attention to the *primæ viæ*; and I am sorry to hear he still continues subject to fever, in spite of quinine."*

"A naturally stout young European officer, had been considerably reduced from repeated attacks of tertian. He was purged with calomel and jalap, and afterwards bled in the middle of the cold stage; he became faint and sick during the operation, which prevented more than about nine ounces of blood from being abstracted. The paroxysm was merely relieved, not cut short. On the third day, he had a distinct paroxysm, less severe than formerly. He was not again bled, nor had he any return of fever for upwards of eight months, nor I believe till this day. In this case, the patient took a few doses of quinine, of 2 grains each, some days after the bleeding, in order to secure its good effects.

"A stout European gentleman, who usually enjoyed good health, had suffered for ten days with fever. At first, rigors were not distinct, but afterwards they became severe in the extreme. His tongue was thickly furred, and his stomach much disordered. He had calomel and jalap, and was well purged; after this he was bled, when the rigors were so strong, that it was difficult to keep his arm sufficiently steady to open a vein; about eleven ounces of blood were abstracted, which relieved him considerably, but not completely. He refused to take quinine, and had no return of fever for six days that he remained at the station. I subsequently heard a casual report, that he had had fever after his removal, by water, to another station. The above summary of my practice

* It is frequently stated by practitioners, that they *never fail* in curing intermittents with quinine. When such an assertion is made, it is safe to draw one of two conclusions,—either that the individual has had little experience, or that he has made a rash and erroneous statement. Many die of intermittent, and its consequences, in aguish countries; and a very large proportion of those who return to Europe with broken constitutions, attribute the commencement of their sufferings to the same cause, notwithstanding the use of this important remedy.

does not include the five cases sent to Mr Twining, and read with his Essay at the meeting of the Society in May 1830.

"I by no means wish to insinuate that bleeding, however successful, can leave a patient in a state or condition to resist future attacks of the same intermittent, or the accession of fever of a different type, when exposed to recurrence of the old, or to a new exciting cause; *but I must differ widely in opinion from any person who says, that blood-letting, in intermittent fever, is either a dangerous or a useless measure.* On the contrary, as far as my experience goes, I need hardly make an exception, when I say, that in almost every case it uniformly affords decided relief; and even when it does not at once cut short the disease, if not carried too far, it never prevents as speedy a cure as could be obtained from the use of quinine alone; because the quantity of blood necessary to be taken is small, it is generally well borne, and so far from precluding, it aids and facilitates the operation of moderate doses of quinine, and other suitable medicines.

"I therefore feel it my duty, and trust I may be considered fully sanctioned, confidently to recommend a judicious use of the lancet in the cold stage of intermittent fevers."

Mr Dempster, in his communication, states that—

"Febris intermittens, (quotidiana et tertiana,) has been a frequent disease in the hospital of H. M. 38th Regiment at Ghazepoor, in the latter half of the year 1830. Many cases were bled at the commencement of the cold stage, to the extent of ℥ viii. to ℥ xvi. with the happiest effects; in most instances the bleeding cut short the paroxysm at once, and in all of them, except one, modified the succeeding paroxysms. I shall briefly mention a few of the cases as they occur in the Register.

"Case I.—Thomas Coleman, admitted 8th July, with quotidian intermittent, had had a regular return for six successive days previous to his coming to hospital, the paroxysm varying every day; he was bled to ℥ viii. in the very commencement of the cold stage of 2d paroxysm after admission. The rigor was immediately cut short; the paroxysm was ended in half an hour, and he had no further return of it, and was discharged to his duty on the 24th.

"Case II.—Thomas Clappe, admitted 17th July, with tertian intermittent. He was bled to ℥ x. in the cold stage of 3d attack, which instantly cut short the paroxysm, and he had no further return of the disease; was discharged to his duty on the 31st July.

"Case III.—Serjeant Thos. Tew, admitted 24th July, with tertian intermittent; had two paroxysms after admission, and was bled to ℥ xii. in the cold stage of the 3d, which cut short the rigor. He had then no further return of the disease, and was discharged to his duty on the 6th August. The same patient was again admitted on the 22d August, with a similar attack; had three paroxysms before he came to Hospital; and was bled to ℥ xvi. in the cold stage of 1st pa-

roxysm after admission, which instantly arrested the rigor. He had no further return of intermittent, and was discharged to his duty on the 29th of the same month.

"Case IV.—James Mason, admitted 24th July, with common continued fever, for which he was twice bled and used purgatives. On the 30th, the type changed to intermittent: he was then bled to ℥ xii. in the cold stage of 1st paroxysm, which completely cut short the rigor. He continued free from further attacks; and was discharged to his duty on 5th August.

"Case V.—Bernard Leonard, admitted 17th August, with continued fever, which in three days after changed to tertian intermittent. He was bled in the cold stage of 2d paroxysm, which almost instantly cut it short: he had no further return of the disease, and was discharged cured on the 31st.

"Case VI.—Matthew Pudmore, admitted 9th September; had two paroxysms after his admission, and was bled to ℥ xii. in the cold stage of the 3d return of tertian intermittent. He experienced instant relief; the paroxysm ceased soon after the vein was opened; he had only one irregular paroxysm on the second day after the V. S. and was discharged to his duty on the 20th.

"Case VII.—William Murdy, admitted 11th Sept. was bled to ℥ xvi. in the beginning of the cold stage of 2d paroxysm of tertian ague, which instantly cut short the rigor; he had no further return of the complaint; and was discharged cured on the 18th.

"Case VIII.—Corporal Francis Collins, admitted 13th Sept. was bled to ℥ xvi. at the commencement of the cold stage of 1st paroxysm after his admission, and 3d attack of tertian intermittent, which completely put a stop to the rigor. He had no further return of ague; and was discharged on the 24th September, quite well.

"Case IX.—Samuel Campbell, admitted 21st Sept. was bled to ℥ xvi. in the commencement of cold stage of 2d paroxysm of quotidian ague, with immediate relief. The rigors were instantly arrested; he had only some slight febrile feeling for two or three days after, without any rigor; and was discharged perfectly well, on 5th October.

"Case X.—Robert Collroon, ætat. 23, four years in India: admitted 24th September, with irregular intermittent, and great determination to the head; for which he underwent the usual routine of treatment in the Hospital, and was convalescent on the 5th October. On the 15th, he had a regular paroxysm of intermittent, at 11 o'clock A. M. and was bled in the beginning of the cold stage to ℥ xii. which cut short the rigor, and the paroxysm ended very soon after. Had a slight return of fever on the 16th, without any previous rigor, and no recurrence of disease afterwards; he was discharged quite well on the 22d.

"Case XI.—William Jeffs, æt. 25, admitted 9th October; had a paroxysm of intermittent the day of his admission; rigor was very severe. On the 11th the paroxysm came on at 2 P. M. when he was bled at the commencement of the

cold stage, to ℥ xv. which instantly cut short the rigor, and the paroxysm ceased soon after. He had no further attack, and was discharged cured on the 18th.

"Case XII.—Joseph Bilton, Private, Grenadier company, æt. 36, nineteen years in India: admitted 14th October; had several paroxysms of quotidian intermittent before coming to Hospital. He was bled at 8 P. M. at the commencement of cold stage, to the extent of ℥ xv. which cut short the rigor, and in less than ten minutes the paroxysm was finished. He had a slight return of fever, not preceded by chill, every alternate night at eight o'clock, till 23d, when he had a regular paroxysm at 8 A. M. Was bled to ℥ xvi. in the beginning of the cold stage; the rigor was instantly cut short, and the paroxysm was ended in about ten minutes. He had no further attack, and was discharged on the 27th.

"I have also practised V. S. in the cold stage of intermittents, amongst the women and children of the Regiment; and have every reason to be satisfied with the result. Other measures were employed at the same time with the V. S. such as active purging, followed by small doses of sulphate of quinine, or infusion of cinchona: and during convalescence, a moderate quantity of wine may be allowed with benefit. When a sensation of fulness in the region of the spleen prevailed with a confined state of the bowels, the spleen mixture, (with or without the sulphate of iron,) has been prescribed, with much advantage to the patient.

"In the greater number of the above patients, V. S. was practised at the commencement of the cold stage, and in almost every case, by myself. I highly approve of the practice, and should I again suffer from ague, I would not hesitate a moment to employ the same treatment for myself; I regret that this practice had not been adopted, when I was such a lamentable sufferer in 1826; as I am confident that it would have saved me from a protracted and distressing illness, which ultimately obliged me to undertake an expensive voyage to sea.

"In every case where I have employed this mode of treatment, I have found the same happy results, with the exception of two. The first was that of a gentleman whom I bled twice at the very commencement of the cold stage, without much benefit; but his case was complicated with acute rheumatism; and he did not pay the strictest attention to the orders which are usually given patients in Hospital. The other was relieved by the V. S. and can hardly be termed a failure of that remedy; for the rigor was always either arrested, or moderated by the bleeding; though the ague fits recurred several times, and appeared to be connected with some visceral disease, attended with cough. The detail of the case is as follows:—A Private in No. 3. Company, was admitted on 22d September, with common continued fever; for which he was bled to the extent of ℥ xxv. and had leeches twice applied to his temples. On the 28th, the type changed to intermittent; the attack came on in the forenoon, and he was bled to ℥ xv. in the cold stage, which cut short the paroxysm. On the 29th, he had a slight accession of fever without rigor, and was convalescent on 3d October. Next day, he had a paroxysm in the forenoon, and was bled in the cold stage to ℥ viii. with but little benefit; however, the rigor was shortened, and the other stages of the paroxysm were slight. He continued free from fever till the 7th, when he had some febrile symptoms. On the 8th, had a severe paroxysm; was bled again

in the commencement of the cold stage, to ℥ xx. which cut short the rigor, and in less than a quarter of an hour, the paroxysm was ended. He had a draught given to him, composed of ℥ss. of spt. ammon. aromat. in peppermint water. Two days after he had some slight pyrexia, and after that, seemed to be doing well till the 18th, when his feet and ancles became œdematous; next day he had cough, with mucous expectoration, and slight difficulty in breathing. Diuretics of the usual kinds were prescribed, with milk diet, and after a few days, some beer. Latterly, the spleen mixture was occasionally administered. Infusion of cinchona, with nitric acid, completed the cure. He was discharged to his duty on the 5th November, quite well.

"It is my intention to continue the V. S. in every case of intermittent fever, where I can see the patient myself, or have a trustworthy person to assist me. I am very fortunate in having my bungalow next to the Hospital, to which I can walk in a minute and a half, or thereabouts."

Mr Griffiths states, that—

"If the two following cases of intermittent fever should be considered by the Medical Society worthy of notice, they are placed entirely at their disposal. It is possible, that occasionally the prejudices of the natives, may induce them to object to blood-letting in agues; and therefore, it may not be easy, at first, to obtain satisfactory trials of that practice, in various parts of the country. These two, are the only cases in which I have yet had opportunity to bleed native patients, during the cold stage of intermittent fever, at Baitool. In both, the disease was of a severe and marked description, and its influence decidedly established in the constitution: the efficacy of V. S. unaided by bark or quinine, was fairly tried, and its power in arresting the progress of the paroxysm in Asiatics, and in preventing its return, could not be doubted.

"Case of Bussarat.—This was a tall thin Mussulman, about nineteen years of age, and of apparently weak constitution. He had come as a servant, from Cawnpore to Baitool. Having slept one night in the month of March, under a tree, he found, on the following morning, that he was unable to move his left arm or leg, without considerable pain; and in the course of the day, was attacked with ague, which proved to be a quotidian. The large joints were attacked in succession by rheumatism; and he continued to suffer under these complaints about ten days. One morning, having mentioned that he felt the cold fit coming on, preparations were made for bleeding. Accordingly, when he appeared to be completely under the influence of the rigors, a vein in his arm was opened, and about twenty ounces of blood permitted to flow; syncope then came on; the rigors ceased, and he had no return of ague.

"It appears worthy of remark, that the rheumatic affection was not benefited by the bleeding, but continued about three weeks; and ended in the formation of an abscess, over the metatarsal joint of the great toe.

"Case of Emambux.—This was a Mussulman, (bhistee, or water carrier,)

about twenty-two years of age; rather above the middle height, of remarkably robust make, and a constitution apparently uninjured by disease or excesses of any kind. Like the subject of the preceding case, he had come from Cawnpore to Baitool.

"June 28th, 1830.—He was this afternoon attacked with ague, which went through its various stages in the usual way.

"29th.—Was again attacked with ague; and on applying for medical assistance, had a dose of ipecacuanha powder given him, which produced no effect.

"30th.—The paroxysm has returned, and he complains of insupportable pain in his head. Ordered to take a full dose of ipecacuanha powder and tartarized antimony, which acted freely upon the stomach and bowels.

"July 1st.—Having mentioned, about noon, that he felt the paroxysm returning, preparations were made for bleeding; when the rigors were fully established, a vein in the right arm was opened, and twenty-four ounces of blood abstracted. The rigors now ceased, and syncope came on. The complaint was completely arrested, as neither the hot nor perspiring stage took place; and he has remained well since. In the course of four days afterwards, he was seen actively engaged in carrying water, as usual.

"From what I have heard, since the above cases were cured, concerning the effects of bleeding, at the beginning of the rigors, in intermittent fevers, I am disposed to think, that a smaller quantity of blood would have answered the same purpose in the cure of these patients: however, the account of their recovery appears to me of some interest, in showing, that bleeding freely at the beginning of the cold stage of intermittent fevers, in natives of India, is not a dangerous practice; and that Asiatics, whose constitutions are not impaired by protracted visceral disease, are found to recover quickly after that mode of treatment."

Several very whimsical objections have been brought forward by Professor Alison, against V. S. in the cold stage of intermittents. These were strongly and eloquently urged in a clinical lecture by the Professor, upon the case of James Bennet, which will be found at page 100. of this work. Statements made in a lecture scarcely demand notice, but as they have been published in one of the Medical Journals, it has been deemed advisable to enumerate the objections here, in order to expose their weakness and fallacy.

1*st*, It has been said by the Professor, *that although V. S. in the cold stage does not actually produce death, as was formerly imagined, its immediate or ultimate effect must be debilitating. Even in a continued fever, when the disease is cut short by the*

bleeding, the effect is debilitating; but as in intermittent we may expect a number of paroxysms, the debility is still more to be dreaded in the progress of the disease. Now, this is after all only a truism; but allowing that the effect would be productive of thrice the degree of debility, yet who would not joyfully compound to cure the fever at the first onset of the disease even at such an additional expense? The cases I have already published, which were narrowly watched by a multitude, I may say, of observers, prove that this kind of debility is purely hypothetical. Not only in fevers produced by sub-acute inflammatory action of some important organ, but also in pure inflammations of the same parts, we bleed in order to produce debility, not as a matter of choice, but as choosing the least of two evils. But this term debility, is ever haunting the imagination of the Cullenians, according to whose erroneous system, not only are spasm, delirium, and the tremors, but also the oppression of the pulse, the disorder of respiration, the want of appetite, the nausea, and the vomiting, which accompany a paroxysm of intermittent, all ascribed to debility. It is no wonder, therefore, that from *à priori* reasoning, the disciples of this system should object to this practice under such erroneous pathological views. But they should recollect that I bleed only in certain cases of intermittent, not to produce debility, but to restore the balance of the circulation at as small an expense of blood as possible.

2*d*, It has also been said, that "*bleeding in the cold stage has generally been condemned, and probably from experience.*" This is too bad! the author begs most respectfully to ask the Professor, by whom has it been practised, and for what reasons condemned?

3*d*, It has been said that it cannot be successful, because "*it attacks the effect, and not the cause, of the disease.*" Let me ask, who knows any thing of the cause of any disease which affects mankind? There is a great deal of pedantry and ambiguity concerning this term *cause*, as it is generally used in medical language. In employing it, some mean to express the agent, whether known or unknown, which actually induces the disease. For example, the application of boiling water to the surface of the body produces inflammation and its conse-

quences. This is a known cause. An imaginary substance, to which the name of marsh miasm has been applied, is an example of the second. It is this unknown substance to whose agency intermittent fever is ascribed. Another sense in which the term *cause* has been applied, is the first diseased action induced by either of the agents. It can easily be shown how very absurd this objection really is, taking it in either sense. In the case of the scald, we are called upon to treat the effect and not the cause;—the hot water is removed, but the effect remains.

A. B. has intermittent fever; the cold stage is long and severe; the constitution is too much oppressed, and the patient dies; or rather let me suppose, he would have died but that he is bled. Is it not absurd to object to the practice, merely because the practitioner is not "measuring swords" with the cause, viz. the marsh miasm, but treating the effect? Or, A. B. has had the cold fit, and is now labouring under high excitement, and the powers of the constitution are unable to produce the sweating stage; inflammation in the head, chest, or abdomen, takes place; or it may prove to be a continued, remittent, or bilious remittent fever; are we not to treat the case pathologically, because we should only be attacking the *effect*, and not the cause of the disease?

In the other sense it will be seen to be an equally erroneous objection, viz. the first diseased action produced by any agent whatever. Let me ask, who can point out the first link in the chain of any morbid action? Is it in the nervous system, or in the vascular? Both are seriously involved. If in one, how is it communicated to the other? Who knows the structure of a nerve, and who is acquainted with its physiology? If in the vascular system, whether is the primary diseased action in the arteries or veins, in the capillaries or the trunks, or is the blood itself affected?

It is wholesome to put these questions home to that medical man who is whimsical in investigating the occult causes of diseases. If the practice pursued by medical men were to be rejected, and condemned as being "*unsatisfactory and unscientific*," (as V. S. in the cold stage has been by Dr Alison,) because they treated the *effect* and not the *cause* of the dis-

ease, I fear the profession of medicine would soon be at an end, and its professors left in a more miserable plight than Shakespeare's poor apothecary. Upon this principle, it is unsatisfactory and unscientific pathology which leads us to bleed, blister, and give purgatives for the cure of any disorder, because we are treating the effect, and not the cause of the disease.

4*th*, Another objection has been made, *that bleeding in the cold stage is only, to say the very best of it, "a palliative remedy."* Does not a similar objection apply to bark and arsenic? "*It may, however, be remarked,*" (says Sir James Fellowes, at p. 382,) "*that, in taking a review of the general practice in intermittent fever, the means usually adopted appear to have had no other view than to lessen the inconvenience of the paroxysms, and that they have not always been sufficiently active to put a stop to the disease in a way that was satisfactory to the patient or to the practitioner.*" To say the very worst of it, therefore, the practice does not stand on weaker ground than the other remedies. I have seen much mischief done by the use of bark in aguish districts; and I have known one man killed by arsenic. Clark (on Long Voyages) mentions a similar accident, but I have as yet known nothing but advantage to proceed from bleeding in the cold stage. I wish not to be understood to mean that bark and arsenic will always produce bad consequences, or that bleeding in the cold stage will invariably prove beneficial. I am convinced that both kinds of remedies require sound judgment in their application; and that, if there be any organic engorgement or alteration of structure, bark must be injurious, if it have any effect at all, and that this is precisely one of the cases likely to be benefited by bleeding in the cold stage.

5*th*, This practice has also been objected to, forsooth, *because it is a "mechanical remedy." It is said "to affect the powers which move the blood, but it cannot affect the altered state of the blood itself."* That it does affect the powers which move the blood, is a fact which cannot be denied, and this is precisely one of its great advantages. But to say "that it cannot affect the altered state of the blood," is a mere assertion. I maintain that it does also affect the altered state of the blood.

Without entering into the physiological controversy about the nature of the changes which the blood undergoes during its circulation through the lungs, I may content myself with stating the fact, that some change necessary to life does take place on the blood in the lungs. From the commencement of the cold stage, the condition of the respiration decidedly proves that the functions of the lungs are much embarrassed. It is not even necessary to inquire into the cause of the pulmonary distress. The lungs cannot perform their functions;—does it not therefore follow that the blood cannot undergo the usual and necessary changes? The blood then must be in a morbid condition, and when taken from a vein in very severe cases, it looks black, and does not coagulate. In such circumstances, when bleeding is had recourse to, it relieves the circulation, unloads the vessels of the lungs, and thereby enables them to perform their functions; the blood is acted upon, and the usual changes are effected. Therefore this "*mechanical remedy*" does also affect the altered state of the blood.

But there is another interpretation of the expression, "*altered state of the blood.*" It may relate to a supposed alteration produced on the blood by the morbid agent, the marsh miasm; and I have no doubt this is the sense intended to be conveyed. In the first place, I may remark, we know nothing whatever of this marsh miasm; we assume the existence of such a substance; and, as has been already stated, some have even ventured to give it sensible qualities, as smell and specific gravity. This is certainly going quite far enough in mystery and darkness; but to say it directly affects the blood, is a gratuitous assertion well becoming a true Cullenian, whose whole system of physic is founded upon, and carried on from page to page by, the most erroneous and the weakest assumptions. This has always been my great objection to this system. Its author lost sight of the true Hippocratic maxim in the investigation of diseases. Cullen declared that there "are more false facts in medicine than false theories;" and on one occasion he asserted in his lectures, that what were called "medical facts were nothing more than medical lies." It will be seen, that whenever Cullen came to a difficulty, in-

stead of waiting patiently for an accumulation of facts to enable him to investigate all its bearings, he made a leap over the obstacle by assuming a certain thing for a fact. He established a system of special pleading, and a symptomatical pathology, which have been exceedingly injurious to medical investigations; and it will soon be generally acknowledged that his labours have retarded, rather than advanced, the science of medicine.

Dr Alison is earnestly requested to peruse all the communications already referred to, in the 5th Volume of the Calcutta Transactions; and the author has no doubt he will take a speedy opportunity of acknowledging, that his own theories are found to be erroneous, by the facts that have been accumulated since he delivered the lecture, in which he was pleased to condemn the practice of V. S. as "*unsatisfactory and unscientific.*"

In conclusion, I wish to impress upon the minds of my readers, that by V. S. in the cold stage of intermittents, we stand upon vantage ground, by affording our patients the benefit of the following circumstances.

1*st*, The injury which in many cases results from the continuance of the venous engorgement, which so constantly leads to organic diseases, is avoided.

2*d*, The danger proceeding either from the want of sufficient re-action, or from its excess, is also avoided.

3*d*, The practice prevents debility, in a direct manner, by saving the vital fluid, as well as by materially shortening the duration of the diseased action.

4*th*, The chance of a return of a paroxysm is diminished; or if it should recur, the force of the attack will in general be weakened; and in that case a most important point will be gained, by affording an opportunity for the administration of other remedies, as bark or arsenic, which might previously have been exhibited in vain.

5*th*, Experience has also taught me, that bleeding in the cold stage is far more efficacious than bleeding during the hot stage, or in the intervals. Several cases are quoted, in which bleeding was had recourse to in the hot stage to moderate threatening symptoms, but without preventing a return of the

disease at the regular period; and in these same instances, bleeding in a subsequent cold fit, had the effect, not only of stopping the existing paroxysm, but of preventing its return.

If any other evidence were wanting to shew the advantage of a radical change in the treatment of intermittent fevers, it will be readily found by contemplating the results which befell one of the finest armies Great Britain ever sent from her shores, and which went to Walcheren on the 5th July 1809. The prevailing disease was intermittent fever, and in the course of six weeks, 8000 sick were sent to England, and 3000 more soon followed. While only seven officers and ninety-nine men were killed in action during the whole campaign, we find that forty officers and 2041 men died from disease. It is further stated in the official returns laid before parliament, that several months after the return of the army, there were on the sick list 217 officers, and 11,296 men! All this took place, notwithstanding the "*scientific*" employment of bark in every form.

A curious and an interesting fact was communicated to me by Dr Foot, (who served with the 17th regiment in India,) when he did me the honour to attend my lectures,—that some Persian physicians apply ice to the surface of the body in the cold stage of intermittents, and, it is reported, with good effect. I have also heard that it is a practice with some in India, to use the cold effusion.

It is proper, also, to mention the plan of preventing the paroxysm upon the first appearance of its approach, by applying tourniquets to the extremities, which was first noticed by Dr Kellie, in the 1st and 2d volumes of the Annals of Medicine.* The tourniquets appear to act, by confining the blood in the extremities, and preventing so much at least of the congestion in internal organs.

Treatment of the Hot Stage.—The best treatment which can be pursued in the hot stage, is to remove the bed-clothes as far as the season and the patient's feelings will admit; to

* This curious remedy is mentioned by Boisseau, p. 523, as if it were the original invention of Lallemand.

sponge the extremities with water; to use cold drinks; and, in fact, to employ every means which can diminish the temperature of the body. If there be symptoms of local inflammation, bleeding is to be had recourse to, either general or topical, which has always been employed by judicious practitioners in such circumstances. I need not speak of febrifuge and diaphoretic mixtures, which are very good for the druggist, will assist in filling the pockets of the routine practitioner, and suit the notions of a symptomatical physician. It is more than doubtful, whether such medicines ever diminished the violence, or shortened the duration, of the hot stage of an intermittent.

Treatment in the Sweating Stage.—When the sweating stage commences, it must be encouraged until the uneasy feelings are relieved, or at least mitigated. Great injury is done by allowing patients to perspire longer, by which they are not only unnecessarily weakened, but the subsequent paroxysms of the disease are in general rendered more violent. The best way of arresting this stage, is to change the linen, after drying the patient carefully with towels, and to place him on a couch. A second paroxysm has been frequently traced to a chill, occasioned by the coldness of the damp clothes, towards the termination of the sweating stage. Should there be no marks of any local inflammation, the patient may be offered light nourishing food, and even wine if necessary.

Treatment during the interval.—The first thing to be done, is to determine whether or not there exist any local disease, and if so, what is its nature and seat. Medical men have hitherto deceived themselves very much by treating this disease, as well as many others, merely from its name; because it is intermittent fever, bark must be prescribed! Another error into which they have fallen, is, that they imagine the only organic lesions which take place exist in the liver and spleen, whereas the brain and the lungs suffer, perhaps, more frequently. I have seen fatal affections of the heart arise in the train of consequences from intermittent fever. Bronchitis is also of frequent occurrence. These facts are stated from my own experience; and, except the last, respecting bronchitis, they are fully proved by the cases and

dissections recorded by M. Bailly, as well as by the facts which are to be found in the works of Pringle, Cleghorn, Chisholm, and others.

If any organic disease exist, bark will be injurious, until it be either mitigated or entirely removed. Sir James Fellowes (Reports, page 350.) states, "that the dissections of those who died, discovered to us a series of morbid appearances of which we had no suspicion, and they enabled us to account for many of the phenomena of the complaint, and to form a more rational plan of treatment than that which we had at first adopted." M. Bailly came to the following practical conclusion: that he bled, to dispose the system to receive the action of the bark, and that he has suddenly, by such means, subdued intermittent fevers, which had previously resisted all other means; and he assures us at page 366, that although he would not altogether proscribe bark, yet he believes that bleeding alone, in most cases, above all, in our climate, would bring about a more substantial recovery. He also makes a very strong statement at page 375. "*In the commencement of an intermittent fever*," says he, "*one is almost always sure to destroy it by a large bleeding;*" and he shews that this disease is not so fatal to poor, debilitated subjects, as to those who are better off, and better fed. For example, the mortality at Rome, where great misery prevails, is 1 in 26 of the whole population; whereas, in the marshes in the neighbourhood of the Sienne, the mortality is in the enormous proportion of 1 to 10 of the whole population. He also assures us, at page 383, that we are not to dread debility; that those patients who were bled by himself abundantly, and at short intervals, not only were not depressed by this debility, but acquired in a few days a state of strength and health which they had not known for a long time. Had this distinguished author been aware of the safety and success of the plan of bleeding in the cold stage, he would not have made the complaint, that in the worst intermittents, that is to say, those in which the patients died in the cold stage, he had "not time to employ bleeding." Speaking of the advantage of bleeding in this disease, he says at page 383:—"*Car j'en excepte toujours les fièvres intermittentes pernicieuses, dans lesquelles on n'aurait pas le temps*

d'employer la saignée, si on ne se rendait pas maître de mouvement nerveux par ce précieux anti-périodique."

It is in such instances that the great advantage of bleeding in the cold stage is most apparent. In some of M. Bailly's cases, stimulants and bark, in considerable quantities, were given without benefit, and in the majority the pulse is described as having been strong.

Bark has been long in use, and although I never denied that it had virtues, yet, when given in substance, in the large doses which are admitted to be necessary, I have so frequently seen it do mischief, that the question has often suggested itself to me, whether it was not more injurious than beneficial? It seems to be injurious, in many cases, by overloading the stomach and bowels with indigestible ligneous fibre, and I have seen it cause serious intestinal irritation, as displayed by griping pains in the bowels, diarrhœa, and painful tenesmus. On examining the stools in these cases, they seemed chiefly to consist of bark, with a considerable quantity of mucus, occasionally tinged with a little blood. That preparation of bark which is known by the name of the sulphate of quinine, is the greatest improvement in modern pharmacy, and the knowledge of its beneficial effects in simple intermittents, affords sufficient proof of the virtues of the substance from which it is extracted; yet this remedy, all-powerful as it is, is useless in the cold stage, and must also fail in cases complicated with organic disease. Dr Fordyce, who had great experience in the treatment of this disease, states, that "*in many cases of perfectly regular tertians, the most skilful practitioners have been baffled in the use of Peruvian bark, and every other medicine recommended as useful in this disease.*" My youthful readers may rest assured, that the same observations are equally applicable to the sulphate of quinine. They may rest satisfied that no means hitherto devised can be universally successful; and the cases have been already pointed out, in which the sulphate of quinine may be expected to be beneficial, as well as those in which the same happy result is not to be looked for. It cannot be too strongly impressed upon the mind, that experience has taught me to

beware of any preparation of bark while the patient has fever, complains of oppression at the præcordia, or has a loaded tongue.

Sydenham's recommendation, of prescribing bark in the intervals, has been supported by subsequent experience. Bark is given in substance, in decoction, infusion, and in extract; but no one who has seen the superior efficacy of the sulphate of quinine, will, I am persuaded, if he can obtain it, ever use bark in any of the other forms. With respect to the doses of quinine, Andral states that Lerminier has prescribed it in a very great number of cases, in two doses of three and four grains each, with an interval of half an hour, four or five hours before the paroxysm. And he assures us, that given in this manner, it has almost always cut the fever short. In some cases, the fever has been equally prevented, by the exhibition of the quinine twelve or fifteen hours before the paroxysm. Once the quinine was given by accident in the middle of the cold stage, and that paroxysm was neither weaker nor more intense than the preceding one. The greater part of those individuals who took the two doses of three grains each, had slighter paroxysms than before; but the fever was not suddenly cut short, as it was in those who took the two doses of four grains each. He also states, that in two cases the sulphate of quinine did not subdue the fever till the dose was increased to twelve grains; and Lerminier gave three individuals twenty grains each during the day, stopping the fever without producing any accident. But with several other patients, to all appearance in the same circumstances with the preceding, a few grains created troublesome nervous symptoms, such as, violent palpitation of the heart; oppression; the globus hystericus; general uneasiness; flying pains in different parts of the chest and abdomen.*

The manner in which I have prescribed quinine, is to give three doses of five grains each, with half an hour of interval immediately before the expected paroxysm; or three grains

* Clinique Médicale, p. 488.

every half hour, beginning about three hours before the expected paroxysm. I have taken three and five grains, without feeling any thing unusual, and afterwards ventured upon ten, but a violent headache followed, which continued for nearly three days; I have given ten grains, however, to others, on two or three occasions, without producing any such effect.

Arsenic has been long in use in intermittent fever, and there can be no doubt that it has often proved serviceable. Fowler's solution is the preparation now in general use, under the name of *liquor arsenicalis;* the dose is from two to twenty drops twice or thrice a-day. Other tonics and bitters have been recommended; the best of these is the infusion of quassia. Opiates have been exhibited immediately before an expected paroxysm, sometimes with benefit, but they generally produce violent headache. Laxative medicines, to keep the bowels open, form an essential part of the treatment; and in general, the stools should be examined. I have met with cases which resisted every remedy, till it was ascertained that the patients had given erroneous accounts respecting the number and appearance of the stools; and upon the bowels being put in proper order, the disease has given way without further trouble. From the idea that intermittent fever is a disease of debility, many practitioners give nourishing and stimulating diet, with wine, in all cases; but after the above pathological account, and the appearances found on dissection, a word more need not be said to shew the impropriety of such treatment. In some instances, nourishment and stimulants prove beneficial, where there is no local disease; but in others, such treatment must prove prejudicial. The patient should be clothed according to the season of the year, and the temperature of the climate. He should avoid exposure in bad weather, (particularly in our climate during the prevalence of easterly winds,) and keep to the house after sunset, till he be sufficiently recovered.

REMITTENT OR YELLOW FEVER.

This is a fever in which there are remarkable remissions, followed in a few hours by exacerbations; so that it bears some resemblance to an intermittent. This circumstance has led Cullen to identify them; and in his definition of intermittents, it will be observed that he has embraced remittents also,—of the last he gives no separate definition. Remittent fever is a disease of warm climates, and when the skin is yellow it has obtained the name of Yellow Fever. The milder forms depend upon general functional derangement, which runs more quickly into disease of structure than is observed in the fevers of this country. Remittent fever has a wide range of character; modifications of the complaint occur without end, according to the organ or organs affected, the character of that affection, the constitution and habits of the patient, and the locality of his place of residence. In its severest form, the viscera of the three great cavities are implicated from the first onset of the disease, and there is no complaint in which the appearances on dissection may be so truly predicted.

Symptoms.—The disease begins, sometimes with great excitement and without rigor; on other occasions, the rigor is severe. Generally speaking, there is some previous indisposition, such as headache and giddiness; want of appetite; symptoms of indigestion; oppression at the præcordia; constipation of the bowels; a feeling of debility and fainting, and bad nights. Sometimes it happens that the patient dies before re-action takes place, but this is comparatively rare; sometimes cases occur where the seizure is sudden and unexpected,—the patient is struck down, as it were; he loses his senses; irritability of the stomach soon appears; black vomiting ensues, and he is carried off in the course of thirty-six hours. "It often occurred," says Dr Fergusson, "to a well-seasoned soldier, mounting the night-guard in perfect health, to be seized with furious delirium while standing sentry, and when carried to the barracks, to expire in all the horrors of the black vomit, within thirty hours from the first attack."

This, it must be confessed, is the most severe form of the disease.

There are many varieties, concerning each of which it is impossible to treat in a work like the present. The most frequent form of the disease, is that in which, after the rigor, which may be more or less severe, there quickly succeed violent re-action, heat of skin, and determination to the head, announced by the following well-marked symptoms; face flushed; conjunctiva injected, the eyes look heavy, and often feel burning; the expression of the countenance leads an experienced person to judge correctly of the severity of the attack. The respiration is hurried, and frequently laborious, often attended by cough, and the patient occasionally sighs, and seems to gasp for air. The head is thrown about from side to side; and the patient is excessively restless from anguish. Intolerance of light, and severe darting pains in the head, are sometimes complained of, as also in the small of the back and down the thighs. There is sometimes a burning pain in the pit of the stomach; exquisite tenderness in the right hypochondrium; unquenchable thirst, with incessant retching of every thing taken into the stomach. The fluid ejected is mixed sometimes with much bile, and accompanied with a discharge of flatus, belched up with great violence; the urine suppressed. The pulse is various even in people similar in age, constitution, strength, and habits; but in plethoric subjects who are seized soon after their arrival in warm climates, the pulse is quick, full, and bounding for a few hours at least, after the re-action is fully developed. In some it is quick and not strong, and in others it is not particularly quick, and it is sometimes very irregular. The tongue is furred, perhaps red, but soon becomes parched and dark-coloured.—These symptoms indicate the first stage of this fever. An anxious and distressed countenance, redness and sense of heat in the eyes, flushed face, intense headache, quick or laborious respiration, burning pain in the region of the stomach, with great thirst and excessive vomiting, announce a formidable disease; but, in my opinion, not so formidable and hopeless as another variety, in which there is some insensibility from the first, with coma, weak and oppressed pulse, and cold extremities.

The duration of the first stage is very uncertain. In severe cases it lasts from twelve to eighteen hours, but in those which are slighter, it may go on for three, four, or five days.

In the second stage the skin and eyes acquire a yellow tinge; the heat subsides; the head is confused, or delirium appears; the breathing becomes quicker and more anxious; the eyes begin to look glazed; the pulse sinks; the retchings are rather more violent; the matter vomited becomes thicker and begins to look dark; and if the person be sensible, he desponds; he occasionally falls asleep, but instantly awakes in great terror; sometimes he starts out of bed furiously delirious, but instantly falls down in a tremor upon the floor; the tongue is always parched, and in general covered with a dark fur; and the skin becomes clammy. In this stage, as well as in the first, there are often cramps in the belly and legs, which distress the patient much. The duration of this stage is also uncertain.

The first stage sometimes terminates by a remission of the more urgent symptoms, when the patient and his friends indulge the fond hope that he may recover; indeed, these remissions often occur, but the deception is soon manifested by the recurrence of all the symptoms in an aggravated degree. In the second stage there are remissions also, particularly towards its termination, when a hope of recovery is again entertained; for although the vomiting be more frequent and more copious, all uneasiness generally subsides, but the pulse sinks, becomes irregular, and intermits; although it sinks in strength, yet it increases in frequency. Nothing is retained in the stomach; the matter vomited is of a dark colour resembling coffee-grounds, and is termed the "black vomit." The breathing becomes more laborious; the tongue has perhaps lost its fur, it is shrunk, dry, and red; the eyes are sunk and glazed; the whole features are sharpened. As death approaches, the limbs become as cold as marble; there is a troublesome hiccup, which perhaps has existed throughout the whole of the second stage. Hæmorrhage sometimes takes place from different parts of the body; the abdomen is frequently as tense as a drum; and death steals on slowly, or takes place suddenly.

The symptoms in each of these stages must of course vary

much according as the brain, the lungs, and contents of the abdomen, are more or less affected. In some instances the functions of the brain remain undisturbed, even to the very conclusion of the last scene; at other times, when there is extensive disease within the head, the delirium is more or less ferocious, or the patient is comatose; he exhibits a variety of nervous symptoms, such as convulsions, rigidity of the extremities, tremors, subsultus tendinum, and picking the bed clothes. Where the head is more slightly affected, the senses are only occasionally obscured; the patient may be said to be lethargic rather than comatose; he is easily roused, and when roused his countenance has a drunken or besotted appearance.

If the lungs be affected, the breathing will be altered from that of health; mere dyspnœa may, however, exist, without any structural lesion of these organs. There may be cough also, attended or not with pain, followed by expectoration. I never saw a case of remittent fever in which the functions of the chylo-poietic viscera were not very seriously involved, as indicated by nausea and vomiting, thirst, pain in some region of the abdomen, meteorism, and altered condition of the stools.

It has been mentioned that the functions of the kidneys seem to be almost, if not altogether suspended, little or no urine being passed during the course of the disease; and upon dissection the bladder is usually found much contracted, as in Cholera.

Another variety frequently met with in very sickly seasons, is that in which a person, after passing several restless nights, is able to go through some of his duties for the first two or three mornings; but this costs him a very great effort. His weakness increases, the bowels are out of order and constipated, or after having been for some time so, he may now complain of diarrhœa; he feels alternate chills and heats, but the least exposure makes him complain of cold; his stomach now begins to get irritable, he takes to bed, the senses become rather obscured, the breathing is affected in no other way than being short, and he cannot, even when he makes an effort, distend his lungs freely; he complains most of oppression at the præcordia. Sometimes a remission of most of these symp-

toms take place, and his skin, which was never hot, and his pulse, which was never full, quick, and bounding, are now felt to be nearly natural; but in a few hours the symptoms become aggravated. The patient is more inclined to be comatose than restless; he complains now perhaps of violent pain in some region of the abdomen; the breathing is oppressed, the extremities cold and damp, while the surface of the abdomen and thorax is hotter than natural; hiccup comes on, the coldness steals onwards to the trunk, the pulse sinks, the countenance looks ghastly, and the patient's fate is quickly sealed.

In a work like this, it is impossible to describe all the varieties of remittent fever which occur in warm countries. It will be sufficient to repeat, that sometimes the brain is the organ chiefly affected, when the symptoms are what may be called cerebral and nervous. In another set of cases, the disease is concentrated on the lungs, when the symptoms will vary accordingly. In another set, the different organs within the abdomen may be affected, producing other varieties; and of these there may be various modifications and complications.

Appearances on Dissection.—These appearances vary much, according to the duration of the disease, and the organ which has been chiefly affected; some dying in the first stage, when we must not expect to see much, if any, appearance of inflammation. Some patients may have been largely depleted, and we shall therefore see less vascularity in their bodies than in those subjects who have lost no blood. Some individuals may have died of remittent fever, with organic lesions produced by previous diseases. All these circumstance must be kept in view when we are employed in the investigation of morbid appearances.

Some blood is generally found in the heart and large vessels near it, and also in the lungs, if the individual have not survived long, or been largely depleted. Pleuritic effusions are sometimes seen, and recent adhesions; the lungs themselves, in some instances, shew various stages of inflammation, and the bronchial tubes are extensively diseased. In the abdomen as in the thorax, various lesions are occasionally observed, viz. the results of peritoneal inflammation; mortification of the bowels;

the liver pulpy, soft, very yellow, and easily broken down; sometimes its structure is completely destroyed, and it has been described by some authors to be in a state resembling "rotten cork." The spleen has been found altered in a similar manner. The stomach and bowels, when slit open, are found to contain more or less of the dark-coloured matter which has been vomited during life; and the mucous membrane very vascular, of a deep red colour, not in depending portions only, but over a great extent of surface, sometimes throughout the whole.

Until lately, it was not much the fashion to examine the mucous membranes minutely; and we still want information on the following points:—Whether the vessels which make such an appearance are in the mucous membrane or not? Whether the whole coats of the intestine are discoloured or not? Whether this colour is owing to inflammation or infiltration? At what particular points ulcerations are most frequently met with, together with a particular description of the appearances of the ulcerated surfaces, and the adjacent mucous membrane. And it would confer a lasting favour upon me, and a benefit on science, if some enthusiastic pathologist would take the trouble to inject portions with vermilion and size, and send them to this country, together with sketches shewing the recent vascular appearances; if to enrich my rapidly increasing museum, the greater obligation will be laid upon me, and no remuneration which it is in my power to bestow, will be thought too great a sacrifice for such a boon.*

Causes.—It has already been shewn that the extremes of cold and heat are not very productive sources of disease. Fevers are produced more by sudden changes of temperature, or by heat conjoined with moisture, than by heat itself, however intense. The state of the mind has also great influence, as well as the habits of the individual.

It has often been remarked, that there is great mortality among troops after their first arrival in a tropical climate. This is sometimes to be attributed to a want of due care on the part of Government, in choosing the season at which they ought

* It may be mentioned, that nothing affords me greater pleasure than to spend an hour in my museum with any pathological inquirer.

to arrive at their destination. I believe a greater number of men will be lost during the first twelve months, if they are landed at the beginning of the rainy season, than after its termination; perhaps the loss will be double. Great care should be taken in the selection of the troops; none but well-seasoned soldiers should be sent out. Sir George Ballingall has written very strongly and sensibly upon this subject, in his excellent work on some of the diseases incident to the troops in India. No young recruit should be sent out to be made a soldier; all his drills and exercises should be completed in this country.

When troops arrive in a distant country after a tedious voyage, it is natural to expect that they will indulge themselves in many ways beyond due bounds. Cheap new rum, and an abundant supply of delicious fruits, attract their attention, and do incalculable mischief. Some men leave England in the utmost state of despondency, and it will in general be observed that they are the first victims. New-comers are also apt to indulge in drinking too largely of cold fluids, and sitting in a thorough draft of air when the body is over-heated; in fact, it requires considerable time before a European obtains knowledge to manage himself properly. Some are fool-hardy, and take no care of themselves whatever; and I feel convinced, that an amusement in which young strangers too frequently indulge, known in the West Indies by the name of "*Dignity Balls*," causes many a death.

Many cases have come under my observation, in which fatal attacks of fever appeared to have been produced by inattention to the bowels; and I am convinced that it is a matter of the first importance to every one going to a warm climate, to keep his bowels open by gentle medicine. Repeated observation has induced me to believe, that a person may very often be exposed to any or all the causes of fever, even in the most unhealthy situations, without being affected, provided his bowels be in a proper state, his mind free from apprehension, and his habits good.

These are a few of the many causes of disease in warm countries, entirely independent of the influence of contagion, marsh miasm, and epidemic influence.

Pathology.—With respect to this part of the subject, I have little to say, except to refer to the general account already given of the pathology of fever. Remittent fevers have the same pathology as other fevers, only it will be found in general that the structure of more organs is involved than in the ordinary fevers of this country. But it may be stated, that no species of fever upholds the doctrines of Broussais more completely than the Remittent.

Treatment.—There have been as great revolutions in the treatment of the fevers of warm climates, as in that of any other class of diseases. The supporters of the doctrine of putridity have, of course, always avoided bleeding even in the first stage, when they admit the existence of inflammation, for fear of the debility which they expect in the latter stages. They begin by clearing out the primæ viæ, and then have recourse to bark in very large doses, without regard to the state of the stomach, local inflammations, or any other circumstances. This is the practice recommended by Clark, Lind, and others. They prescribed opium, for the purpose of keeping the bark upon the stomach, and gave wine and brandy in considerable quantities, with the view of supporting the strength, keeping off the stage of collapse, and preventing putridity. But it may be stated without fear of contradiction, that this practice cannot be too severely condemned. It should be recollected, that the stage of collapse must come on sooner or later. No person can pass from a state of fever into that of health and strength; and the longer it is postponed the worse will it be for the patient, whose situation very much resembles that of an individual in debt, who puts off the evil day from time to time by various means, and when his creditors meet at last, he is found without means to pay, whereas, had he disclosed his real situation sooner, the strength of his credit would have survived the shock without injury.

The late Dr Chisholm, about the year 1793, introduced the plan of affecting the system with mercury as speedily as possible, employing bleeding in small quantity, and only occasionally, more with a view of enabling the system to receive the mercury, than as a powerful measure calculated to subdue the diseased action. Now my recommendation would be the re-

verse, to use bleeding early, as the chief means, in cases which require depletion, and mercury afterwards as an auxiliary. The celebrated Dr Rush bled and gave calomel to diminish the increased action; and the reason this practice did not maintain its ground, is, that he trusted a little to the bleeding, and a little to the calomel, on the principle of gradually depleting the system. He rarely took more than ten ounces of blood at a time; and notwithstanding he repeated the bleedings from day to day, yet he never produced sufficiently decided effects upon the disease, although he sometimes took away from one hundred to one hundred and fifty ounces of blood. The practice would have been far more successful, had he taken away twenty, thirty, or forty ounces at once.

When bleeding is thought necessary in this disease, it is trifling with the patient's life if the blood be not allowed to flow till some impression is made upon the disease, and upon the system; and it is impossible to determine beforehand the quantity which will produce one or other of these effects. This is the kind of practice which was pursued by myself and many others who were in the West Indies nearly thirty years ago; and it appeared to be attended with great success.

Some practitioners trust almost exclusively to the action of mercury, and in India more particularly, it is deeply to be regretted that a great waste of human life has consequently taken place. Some years ago, Dr Halliday, of the Honourable East India Company service, was, by order of the Marquis of Hastings, put under arrest, and deprived of rank and pay, for shewing, by most incontrovertible evidence, that in the General Hospital of Calcutta, *the enormous quantity of* 26 *pounds of calomel were consumed by* 886 *patients:* And that under the painful digestion of this mineral, the proportion of deaths was 1 in about 6¾ of the whole sick list,—whilst under a more rational treatment the mortality was reduced about one-half: In fact, that the mortality bore almost an exact ratio with the quantity of calomel exhibited. After a delay of many years, Dr Halliday was restored to his rank by the express order, more than once repeated, of the India Directors. This transaction has never been brought before the British public, but having carefully perused all the evidence, I have no hesitation

in declaring, that as a piece of persecution, from beginning to end, there is no parallel case to be found in the annals of any free country. Wherever the story is known, it must cause a blot, never to be effaced, upon the memory of the then Governor-General of India and all his advisers, military as well as medical.* The result of the practice of the rising medical officers in India has fully corroborated the statements formerly made by Dr Halliday; and mercury is now not so much abused as it once was. And as pathological knowledge advances in India, which it is doing rapidly, mercury will be still less trusted to. It must be always kept in remembrance, however, that the liver suffers more frequently in the fevers of warm climates than in this country, and therefore mercury, under judicious management, cannot be altogether dispensed with.

In 1796, the deaths in the West Indies under Dr Chisholm's mercurial plan were never exceeded, amounting to nearly one half of the whole number of troops.

The bold and decisive use of the lancet in this disease has met with an able and influential advocate in Dr Jackson, who was Inspector of Army Hospitals in St Domingo, and subsequently in the Windward Islands. This distinguished individual bled to the extent of thirty, forty, fifty, sixty, and even eighty ounces at once in the very beginning; and he repeated the operation within three hours, if the first evacuation had not been productive of permanent benefit; after this he gave calomel in doses of from five to thirty grains, repeated every third or fourth hour.

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* The author regrets want of sufficient space to speak more fully of the transaction, but he cannot avoid annexing an extract from a letter addressed by the East India Directors to the Governor-General, after full investigation.—"In the mean time we authorize and direct you to remove the restrictions you have placed to the further employment of Dr Halliday, unless stronger objections shall exist to his restoration, than those which have been reported to us in the proceedings under consideration. It appears to us, that your interference in the professional discussions which were brought under your notice, has been carried further than is desirable, or consistent with the improvement of medical science." Notwithstanding this communication, Dr Halliday was doomed to undergo still further persecutions.

Bleeding has been strongly objected to, on account of the condition of the blood. In some cases it appears of a very dark colour, and streaked with red and blueish lines; it coagulates very imperfectly, sometimes not at all, and does not separate any serum. It is in the state commonly called "dissolved blood," and which announces, it is supposed, a putrid state of the whole body, and particularly of the fluids. This appearance does not deter me from recommending a repetition of the operation, as I have been long aware, that it exists more or less in all severe cases of congestion. It has been frequently seen by my pupils, in cases of intermittent fever, in which I bled in the cold stage; and also in cases of congestive fever. It has also been noticed in Asiatic cholera, and a similar condition of blood may be seen in patients affected with the common cholera of this country, and has been observed in some severe cases of bronchitis.

Dr Rush says he paid no attention to the dissolved state of the blood when it appeared on the first or second day of the disorder; but repeated the bleeding afterwards in every case where the pulse indicated it. He states a fact which I can verify, that it is common to see sizy blood succeed to that which was dissolved. He states also, that he was never deterred by the presence of petechiæ from blood-letting in cases in which the pulse retained its fulness or tension.

Although the necessity of keeping the bowels freely open in this class of diseases must be admitted, yet I had not been long in a warm climate before I observed the injurious consequences produced by strong drastic purgatives, and many individuals were lost by the constant irritation kept up by this means. The appearances on dissection, too, warrant me in cautioning practitioners not to persevere too long in using strong purgatives; there can be no advantage from moderating irritation and increased action, if these be immediately re-excited. The common purgative formerly used in the West Indies, was ten grains of calomel and a scruple of jalap. Emetics have been often extolled, but I believe every experienced tropical physician will agree with me in cautioning young practitioners against their indiscriminate employment; irritability of the stomach is one of the most frequent and

troublesome symptoms, and once excited, it is always difficult, in many cases impossible, to restrain it. I have seen emetics exhibited, and the vomiting has continued till death, in spite of every remedy. The same caution is necessary with regard to those remedies that are employed for moderating the action of the heart and arteries. When in the West Indies, I have often regretted not having a command of leeches, and am persuaded, that upon a proper representation, the Government would take steps, at whatever expense, to secure a proper supply to the medical officers of the army and navy. There is no disease in which dissection reveals so many organic lesions, and the efficacy of abstracting blood in such cases by leeches is generally admitted, particularly after the severity of the disease has been broken by the lancet.

After the publication of Dr Currie's work, Cold Affusion became generally used in remittent fevers, but much mischief followed, and it has fallen into disuse. Dr Currie has distinctly stated, that it is not admissible in cases where there is any internal inflammation; therefore, in the majority of cases of the fever now under consideration, the practice will be found to be injurious rather than beneficial. But when the skin is dry and burning, nothing gives the patient more temporary relief, than spunging the body with water, or vinegar and water, which ought to be very frequently repeated.

The application of blisters and other contra-irritants are highly serviceable after bleeding, &c. but should never be had recourse to in this, or any other fever, in the early stage of the disease.

Stimulants sometimes appear to save life, but in candour it must be mentioned that I have also seen them very prejudicial; nothing in the whole practice of physic requires more caution and experience than their exhibition; but I shall speak more fully upon this subject when treating of the fevers which prevail in this country. The best stimulants are wine and brandy; in many cases where the stomach is irritable, brandy will be found to be superior to wine. In the last stage, great care should be taken to support the heat of the extremities.

Partly from the notion of the resemblance between remit-

tent and intermittent fevers, and partly from this disease being supposed to be one of putridity, bark has been employed. By some it is recommended throughout the whole course of the disease, by others only during the remissions, and in the last stage; but I believe it has done more mischief than good. I have often had to blame myself for bringing on an exacerbation, not only by the use of bark, but by nourishment and stimulants, during the first remissions; and a strong impression is left upon my mind, that it would be better for patients if less were done for them in the state of apyrexia, and also in the commencement of convalescence. No doubt, however, can be entertained, that the sulphate of quinine will be of signal service in many cases.

INFANTILE REMITTENT.

Many diseases occurring in infancy and childhood have obtained this name, viz. inflammation of the brain and lungs, the irritative fever produced by teething and worms, rheumatic affections, &c.; in all of which, and even in cerebral and pulmonary inflammations, there are very remarkable remissions in young subjects. But the disease which is to be considered in this section is a febrile affection, which is in general found to depend on irritation, inflammation, or ulceration of the mucous membrane of the stomach and bowels.

Symptoms.—The little subject is observed to be listless, fretful, and thirsty, and to pass restless nights, with some heat of skin. In a few days the skin is hot and dry, the thirst and restlessness are increased, the breathing is hurried, and the pulse very quick. The child is more uneasy and restless at night, but towards morning the skin becomes slightly moist, when it has some disturbed sleep; the bowels are constipated, or there is diarrhœa, but the former is more frequently met with; or there is frequent desire to go to stool, but little is passed; if there be any evacuation, it is discoloured and fetid. In colour, the evacuations are not always dark, but sometimes white, shewing a deficiency of bile, and sometimes blueish, but always offensive, often mixed with mucus, and occasionally with a little blood. The child cries frequently,

and draws its knees up to the breast;—it cries more when the belly is touched, which is hotter than the rest of the body, and tympanitic. It prefers to drink cold water, and frequently shews signs of increased abdominal pain after a copious draught; the stomach is occasionally very irritable, and every thing is vomited; the tongue, being at first moist and loaded, and occasionally very red round the edges, soon becomes dry over a triangular space at the tip. On some occasions it is difficult to keep the hands and feet sufficiently warm, while the face is flushed and the rest of the body parched.

If proper treatment be not soon pursued, the functions of the brain occasionally become disturbed, and it is difficult, in many cases impossible, to determine whether or not disease of structure is going on in the head.

On other occasions the respiration, which has been hurried from the first, owing perhaps merely to increased circulation through the lungs, becomes laborious, a troublesome short cough also appears, and, in general, auscultation will announce a more or less extensive inflammation of the bronchial membrane; and if the disease be not subdued, wheezing and expectoration follow. Sometimes the child appears to be recovering for a few weeks, and then relapses; during the remissions he gains flesh and strength, but the abdomen remains tumid, and in this condition he may continue getting better and worse till the mesenteric glands become enlarged, or dropsical effusion takes place in the abdomen; the emaciation increases; there is no fever except at night; the appetite is occasionally voracious. In fact, the little sufferer presents all the symptoms of the disease usually known by the name of *Tabes Mesenterica*.

Appearances on Dissection.—The chief traces of disease are found in the abdomen. Sometimes peritoneal inflammation seems to have been the immediate cause of death, and I have had many opportunities of ascertaining that inflammation of this tissue has been excited by the extension of ulceration from the mucous membrane, through the muscular and serous tissues. The mesenteric glands are found very generally enlarged, sometimes enormously so, and seem to consist of a cheesy-looking matter, which is usually described as depend-

ing on scrofulous action, but perhaps hastily, and without good foundation. On cutting into the stomach and bowels, the mucous membrane will be found in various conditions, occasionally very vascular, thickened, softened, or ulcerated. The ulcerations in the ilium and colon strictly resemble those which I have afterwards to describe in the bowel-complaints of children, except that the whole mucous surface of the colon is occasionally involved in one sheet of ulceration, with a rough and ragged surface and hypertrophy of the other coats, as is observed in many cases of phthisis pulmonalis. When there is no ulceration, we sometimes see mere vascularity, with or without softening of the mucous membrane; the quantity of thick mucus adhering firmly to the surface is very great; and it is curious, that after being carefully removed by washing and wiping, I have seen fresh exudations take place during maceration, not only in water, but in spirits; and I have been surprised, after having laid aside preparations for many months, to find them again thickly coated over with mucus. Large abrasions are also sometimes found in the mucous membrane of the stomach, at the splenic extremity, which have penetrated through all the tissues at one point; in other places they appeared to be converted into a gelatinous mass. From careful examination, it would seem that this kind of disorganization is the effect of previous inflammation. This appearance has excited considerable interest of late years, and has been noticed on the Continent by Cruveilheir and others, and in this country, many years ago, by Underwood. The Profession stands greatly indebted to Dr John Gairdner of Edinburgh, who has collected a great number of interesting cases, some of which occurred in his own practice, and which will be found in the first and second volumes of the Medico-Chirurgical Transactions of Edinburgh.

It has been stated in the description of the complaint, that symptoms of cerebral and pulmonary disease sometimes become lighted up; but on watching the progress of the affection, these are observed not to form essential parts of it; nevertheless, the appearances sometimes found in the head and thorax, deserve to be mentioned.

In the head there is generally effusion in the ventricles,

and also between the arachnoid and pia mater, with great vascularity in the latter membrane.

In the thorax, the most common morbid appearance is found in the bronchial membrane, which is vascular, and the tubes are more or less filled with mucus; which is to be described more particularly when treating of bronchitis. The substance of the lungs also shews various degrees of inflammation, and occasionally there are traces of pleuritis.

Causes.—These are indigestible food, such as crude vegetables, sweet-meats, &c.; the habit of allowing children to eat too many articles of food at one meal; together with insufficient clothing and unwholesome food, to which the children of the poor are so frequently exposed. Teething sometimes produces symptoms like those above described.

Pathological Remarks.—From this view of the phenomena of the disease, together with the appearances on dissection, and the causes, the reader will have anticipated what I have to state respecting the nature and seat of the disease, that it depends on irritation and inflammation of the mucous membrane of the stomach and bowels, particularly of the latter.

Treatment.—Abstinence from solid food is necessary; even biscuits, crusts of bread, and the pulp of oranges, frequently produce relapses. Leeches should be applied to the abdomen in all cases where there is much vascular action, pain, or heat of skin, if gentle laxatives, frequently repeated, do not mitigate the symptoms. Fomentations should be applied to the abdomen; when the skin is hot and parched, sponging the body frequently with tepid water will often take off the restlessness. The practitioner should be particular in all cases, but more especially in attending children, to examine the stools, and the quantity of clothes with which they are too often covered. A remarkable case occurred to me four or five years ago, which is worthy of being mentioned. A child aged seven was seized with some degree of chilliness, followed by re-action, thirst, want of appetite, nausea; the respiration became hurried, and he complained of considerable headache. He was ill for five or six days before I saw him, and had taken repeated doses of salts and senna. On examination, I found the abdomen distended, tense, tympanitic, and some-

what painful to the touch; his thirst was considerable, the respiration quick, the face flushed, with some headache, and he complained of noise and light; the tongue loaded with a white fur, moist every where but at a small triangular space at the tip, which was red, as were also the edges; he had no vomiting, but a dislike even to the smell of solid food; he was very uneasy and restless, passed sleepless nights, and the pulse was quick, but not particularly strong. During the course of eight days, leeches and fomentations were frequently had recourse to, and with marked relief, but always of short duration. Gentle laxatives were frequently given, and injections administered, but all to no purpose; the stools were slimy and scanty, and as the child had been so long without even taking gruel, it was imagined that the bowels were empty. The abdomen was blistered. At last, something excited my suspicion respecting the state of the bowels, and castor oil was given on the fourteenth day, every second or third hour, after a moderate dose of calomel and jalap. On going to stool, he complained very much of pain; he was observed to strain most violently; and after some time, he passed what appeared to be a very large fetid stool, which surprised me very much; it was so large that I was induced to examine it minutely, when three hard masses were discovered, surrounded with a great quantity of mucus. Upon close examination, they proved to be a dollar biscuit, and two pieces of solid meat; the biscuit was soft, but quite undigested and whole, with the exception of its margin, part of which had been broken off; the depressions generally made on the surface of biscuits were quite distinct, as also several of the letters of the baker's name. This biscuit was seen by a great number of gentlemen who were attending my lectures at the time, and is now in my museum. One piece of meat was large, and must have formed a good mouthful; the other was small, but both were quite unchanged by digestion, and not so putrid as might have been expected. It appeared that the boy was frequently in the habit of *bolting* whatever he had in his mouth, without mastication. His recovery was progressive after he got rid of these substances.

If the disease become chronic, occasional leeching, perseve-

rance in gentle laxatives, a nourishing, but mild and bland diet, a long perseverance in contro-irritation on the surface of the abdomen, by means of the tartar-emetic ointment, and an occasional warm bath, are the best remedies. If there are evidences of effusion into the abdomen, with scanty secretion of urine, a preparation of calomel, squills, and digitalis, in doses proportioned to the age and strength of the patient, will be found serviceable, together with drinks acidulated with cream of tartar. Many of the students attending my Dispensary, have seen remarkable recoveries under the plan of treatment above described, even in cases which at first appeared to be almost hopeless.

CONTINUED FEVER.

Cullen and others maintain, "that there is no such disease as that which the schools have called a Continued Fever." There can be no doubt, however, that there is such a class of diseases, if we look at nature; and that Cullen would have seen it if he could have looked through any other medium than that of his own erroneous theories. Cullen's definition—"*Fevers, without intermission, and without being produced by marsh miasmata, but with remissions and exacerbations, though not always considerable, continuing; two paroxysms in each day.*"

Although all his definitions are bad, this is to be regarded as almost the very worst. Often have I seen slight continued fevers terminate in regular intermittent, and intermittent in continued fever, at least as much as any fever can be said to be continued; continued until death closed the scene, or rather, I should have said, till that stage of collapse took place which precedes death. This definition must be admitted to be too fine-spun; for if there be no continued fever, it may be also said there is no continued inflammation of the brain, or of any other organ. In all fevers, as in all diseases, there are intervals in which the patient is easier, and appears,

perhaps, rather better; and there are also nocturnal exacerbations, which may be partly attributed to the sick being worn out and made worse by fatigue, heat, light, and noise during the previous day.

All the fevers which are to be described in this class, are called "idiopathic," as well by those writers who have identified in their own minds fever with inflammation, but who will not allow the existence of "*any primary local disease*," unless that disease be one of inflammation, as by others, who deny the existence of local inflammation in fever. Cullen belonged to this last class, and he states that he never had seen a case of inflammatory fever but one, therefore he endeavoured to place these fevers altogether beyond the pale of pathology. In this spirit has he framed the definition of fevers: "*After languor, lassitude, and other signs of debility, pyrexia; without any primary local disease.*" The reader will see at once the absurdity of this symptomatical pathology, which denies to any fever whatever, except hectic, any primary local disease; for Cullen is subsequently compelled to place inflammatory fever as one of his orders, and although he gives a very common-place reason for calling inflammatory fever "*synocha*," and an explanation that this term is not to be used in its "*vulgar acceptation;*" yet we are not to be told in the present day, that the pathology of a disease can be changed by a mere name, which any one may invent. All Cullen's disciples will be found to fall into the same error, but they become caught in their own net in describing the order Synochus, which, according to them, is a compound fever, of an inflammatory nature in the first stage, and typhoid in the second.

Cullen, in the 141st paragraph, makes the following statement:

"In the case of synocha, *(inflammatory fever)* therefore, there is little doubt about the propriety of blood-letting; but there are other species of fever, as the synochus, in which a violent re-action and phlogistic diathesis appear, and prevail during some part of the course of the disease; while, at the same time, these circumstances do not constitute the principal part of the disease, nor are to be expected to continue during the whole course of it; and it is well known, that in many cases the state of violent re-action is to be succeeded, sooner or later, by a state of debility, from the excess of which the danger of the disease is chiefly

to arise. It is therefore necessary, that in many cases blood-letting should be avoided; *and even although, during the inflammatory state of the disease*, it may be proper, it will be necessary to take care that the evacuation be not so large as to increase the state of debility which *is to follow*."

It was Dr Baillie's opinion, that typhus was as rare as Cullen states inflammatory fever to be. The truth is, that much depends upon the class of people among whom a physician practises, and the period of the disease at which he generally sees his patients. Our army and navy surgeons have to treat fevers in subjects well fed and clothed, and whose regularity of conduct is enforced by military discipline, which physicians cannot expect among the inhabitants of St Giles in London, and the Cowgate in Edinburgh. Therefore they seldom see pure typhus in their practice; and they will have to blame themselves if they often meet with synochus; for they are too bold and intelligent, and are too well versed in military tactics, not to attack the enemy before he gets possession of their strongholds; and they will rarely be found guilty of declining an engagement for fear of another enemy which *may* appear when they are weakened by the combat. Soldiers and sailors can very rarely conceal a fever; so that they are brought at once to the medical officers, who therefore see the disease early, and before it becomes complicated. A great deal also depends upon the treatment pursued in the first stage. If a physician were always afraid in the first stage of fevers to apply the proper remedies, when inflammatory symptoms presented themselves, lest a low or putrid tendency should subsequently occur, he will of course frequently see the compound fever "synochus" in its worst form.

I have now to treat, *first*, of fever from functional derangement; *secondly*, fever from inflammation; *thirdly*, fever from congestion; *fourthly*, a mixed form of fever, consisting of a combination of these three, but in which congestion generally predominates at last, commonly called Typhus and Synochus.

FEVER FROM FUNCTIONAL DERANGEMENT.

All ages and classes of society are liable to this form of fever; but more particularly children, and those who have the inclination and means to overload the stomach and bowels

with too much nourishment. It is not, in general, very formidable; but cases are occasionally met with which are abundantly alarming, and difficult to treat, from the impossibility of fixing upon any one organ which can be said to be affected severely, and yet all organs are out of order, giving rise to considerable constitutional disturbance. In some cases the symptoms are exceedingly slight for a week or ten days. The patient often feels chilly, which he is apt to attribute to the weather—increasing weakness and languor, which he thinks are owing to impaired appetite; he has restless nights, with burning heat in his hands and feet, and some thirst. At last his whole surface is hot; he perhaps goes to stool once a-day or even twice, and he passes something, which satisfies him that his bowels are right, when all the time they are constipated; and when a medical man is called, he will find him much in the following state:—skin parched; thirst considerable; tongue loaded with a yellow fur; without appetite; and the pulse perhaps about 95 or upwards; the urine scanty and high coloured. He complains of restlessness, particularly at night; and general uneasiness, with oppression at the præcordia; he has slight headache; but complains most of pain in the lumbar region. The stools, when examined, will be found fetid, scanty, and adhesive; or watery and dark coloured, containing small hardened portions of feces, often mixed with a good deal of mucus. He loathes the articles of food which in a state of health he most relished, even tea and coffee, milk, beer, &c. During the night, his mind wavers; if he fall asleep, he appears restless and disturbed, and awakens with a start, the effect perhaps of a terrific dream; occasionally there is delirium. In some cases these symptoms continue even in a slighter degree for fourteen or fifteen days, and at last terminate in local congestion, or in inflammation of some organ, and in the end assume the type which is termed typhoid; in fact, these are the cases, particularly where there is delirium, which many people call "typhus mitior."

Sometimes the fever is very sharp, and there is considerable excitement, with increased heat, general uneasiness, and delirium; the pulse above 100, full and strong; much oppression at the præcordia; the respiration hurried; the tongue loaded,

perhaps dry and parched; and the bowels very much disordered.

Treatment.—I have a great dislike to treat this form of fever, and for the following reasons: First, the patient has been long ill before he confined himself and sought for medical advice. Secondly, the symptoms even then are apparently mild, while internal organs are seriously impeded in their functions. Thirdly, if inflammation have taken place in any internal organ, it is more difficult to treat than in pure inflammatory fever, in consequence of the exhaustion occasioned by the previous indisposition. Fourthly, nothing can be beneficial if the greatest attention be not paid to the moral management of the patient, giving him laxative medicines at regular periods, and rigidly withholding improper articles of food. This is the kind of fever which is in general cured by confinement to bed; a steady perseverance in gentle laxatives, repeated two, three, and even four times a-day; quietness, and abstinence from solid food. These are the cases in which wine is often prescribed by Brunonians, with far less detriment than solid food or beef tea. These are the cases in which the cold affusion has been so serviceable when used in the early stage, because there is as yet no local inflammation.

Bleeding is certainly not necessary in all cases, but it is ser viceable in many. I have had several cases of this description on my hands at one time during the autumnal months; and I have chosen patients resembling each other as closely as possible in habits, temperament, &c. Blood has been drawn from some of these and not from others, and I never had reason to regret bleeding, but have often had to lament not doing it. It may be here mentioned, that bleeding is often employed from other motives than to cure inflammation. It is sometimes employed to moderate excitement, to diminish plethora, to alter irregular determinations of blood, and also to remove venous engorgements; but the only period for the lancet is the first days of the disease.

In such cases bleeding may be objected to, as it has been even in inflammatory fevers, but I am sure it is safe in a majority of cases; and this conclusion has been strongly impressed upon me by observing the manner in which this kind

of fever, in particular, frequently terminates. First, it sometimes terminates upon the appearance of an eruption, which eruption is generally urticaria, sometimes erysipelas. Secondly, it often terminates by epistaxis. Thirdly, by diarrhœa. Fourthly, by profuse night-sweats. And fifthly, by small boils, and even abscess. Taking a common-sense view, in reflecting upon these matters, I cannot help coming to the conclusion, that it is best for the practitioner to take the law into his own hand, and to deplete in cases which require it, before the strength of the body is reduced by the natural effects of diseased action. If in doubt about the propriety of general bleeding, the practitioner can have recourse to leeching; and in the class of cases now under consideration, the best place to apply the leeches is upon the abdomen or loins. Experience has led me to this practice, even in cases, in which, although the symptoms ran high, no local inflammation could be detected, and I can speak strongly of its success;—the number of leeches to be proportioned to the age and constitution of the patient, as well as the severity and duration of the disease. Emetics are very serviceable in the first stage of this fever, in order to unload the stomach of any crudities it may contain. It has been already stated, that laxatives frequently repeated are highly necessary:—to an adult I give powders consisting of two grains of calomel, and six or eight of jalap or rhubarb, or a pill with the same quantity of calomel and four grains of the compound extract of colocynth. A child of six years old will require the same quantity of calomel, and four grains of jalap or rhubarb,—the dose to be repeated every second, third, or fourth hour, according to circumstances, till evacuations are produced, or till a fourth dose has been given, when the medicine is to be assisted by the administration of mild injections. Fomentations may also be applied to the abdomen. If the body be hot, it should be spunged with cold or tepid water, as may be most agreeable to the patient's feelings. Opiates are rarely admissible in this form of fever.

In neglected, or ill-treated cases of this class of fevers, affections of the brain, or bronchial membrane, are greatly to be dreaded.

FEVER FROM INFLAMMATION.

It will be recollected that, in a former part of the work, the arbitrary doctrines of fever promulgated by different individuals, viz. that fever depended upon inflammation of one particular viscus or set of viscera, were rejected; and my own opinion was distinctly stated, that inflammation of every tissue of the body, occasionally gave rise to febrile disease.

Symptoms of Inflammatory Fever.—In this disease the combination of symptoms denominated fever is present, and depends upon inflammation of an acute or sub-acute nature, of some organ or tissue of the body. Cullen's definition: "*Heat much increased; pulse frequent, strong, and hard; urine red; the animal functions but little disturbed.*"

Although this fever sometimes takes place without any cold stage, yet it is generally ushered in with a rigor. During the early stage, the patient feels drowsy, yet cannot sleep; he is reluctant to move from one room to another, from a feeling of languor and debility; there are loss of appetite, vitiated taste, thirst, loaded but moist tongue, which soon becomes dry; general soreness is complained of, and there are nausea and vomiting; headache, and pain in the back; occasionally a combination of all these symptoms is present. Sometimes after the first rigor, heat of skin, and all the other symptoms of fever, immediately set in; on other occasions, there are alternate chills and flushes of heat for several days, till at last the heat predominates, and is permanent; the face is flushed, the skin intensely hot, with thirst, restlessness, general uneasiness; in most cases there is more or less delirium at night.

It is necessary to observe, that the symptoms vary according to the organ principally affected; but in all cases where there is great excitement, the breathing is quick and anxious, the belly costive; the tongue becomes parched, but it may be loaded, or very red, with its papillæ much raised,—or intensely red only at the tip and round the edges; the pulse is generally full, strong, and bounding, beating above 100, perhaps even 130 in the minute; there is also oppression at the præcordia. In very acute cases, the skin has been observed to be

not only parched and burning, but red, making a considerable approach towards an exanthematous affection.

Inflammatory fevers occasionally terminate by hemorrhages from different parts of the body, particularly from the vessels of the nose and bowels; by diarrhœa,—collections of matter in various parts of the sub-cutaneous cellular membrane, and by profuse sweats. But these natural terminations are not to be depended upon.

If the fever go on without proper treatment, disease of structure ultimately takes place, in severe cases as early as the seventh or eighth day; in slighter, not before the twelfth or fifteenth; and in still slighter, not till between the twentieth and thirtieth. Whenever this event happens, all the symptoms of typhus gravior, with petechiæ, &c. take place, and then the case is called synochus. It has been stated that the symptoms vary not only according to the nature, but more particularly the seat of the disease; and it is necessary in this place to give a description of these, which may be made applicable to the other kinds of fever.

There are several general symptoms which are common to a great number and variety of diseases; as headache, heat and dryness of skin, thirst, nausea, restlessness, anxiety, oppression at the præcordia, dyspnœa, scanty urine, small fetid stools, &c.; but there are some symptoms which particularly announce disease of particular parts.

If the brain be affected with inflammation, the symptoms will vary according as the inflammation affects the membranes, or the substance of the brain itself. If the membranes, there will in general be delirium, increase of strength, so much so, that it will require some care to keep the patient from starting out of bed; the eyes vascular, with the pupils contracted or dilated, and the countenance may present a ferocious expression; the patient will perhaps complain of pain of head, by gesture if he cannot by words; the carotids will throb, there will be great restlessness. The face is not always flushed, it is sometimes pale; the pulse will be various, the tongue dry, and perhaps in constant motion. Subsequently starting of the tendons, picking the bed-clothes, and sometimes convulsions, take place, particularly in young subjects; the patient shews a dis-

position to sleep, and then becomes comatose, which state gradually increases; the pupils are dilated, and squinting often occurs. The respiration becomes more and more rapid and irregular, with an occasional interruption, immediately followed by a sigh; the pulse, which had been quick at first, and had afterwards become slower, is now again rising in frequency; it is irregular, and intermits. The coma becomes more profound, and death takes place, with or without convulsions.

If the substance of the brain be inflamed, the heat of skin may not be increased, the pulse may fall under the natural standard; perhaps it will beat 60 or 50, and I have seen it even slower. The extremities may be in constant motion or not; they may be rigidly contracted, particularly the fore-arms, or if not so, they become contracted the moment the arm is touched even to feel the pulse. The rigidity may be confined to one arm with or without paralysis; the pupils are generally dilated, and the eye-lids half or fully open, sometimes one is shut and the other open; the tongue is not dry till towards the last stage of the disease.

In both varieties the respiration is much in the same state. The bowels are generally bound, and when stools are procured, they are passed involuntarily in bed, as is the urine; sometimes the bladder loses its powers completely, and becomes greatly distended.

If the lungs be affected, the respiration will become more laborious; there may be cough, with more or less expectoration; the patient may complain of a sensation of rawness under the sternum and in the windpipe, or perhaps a stitch in the side may be felt; but here, as in all affections of the chest, we must make use of our ears in addition to the other symptoms, in order to discover whether any inflammatory affection is going on in the respiratory organs. The advantages of the grand discovery of auscultation will be stated more at large when treating of the diseases of the chest; but it may be now mentioned, that even before I had been much used to the stethescope, I was able to point out "*primary local affection*" to exist in the lungs, in cases which were supposed to present the pure idiopathic fever.

If the seat of the inflammation be within the abdomen, it will in general be announced by one or more of the following symptoms,—pain, increased on pressure; but it must be remarked, that when the mucous membrane of the intestines is the seat of the phlogosis, frequently little or no pain is experienced even upon pressure. The patient will prefer that position in which the abdominal parietes are most relaxed; there is more or less tympanitis; and the heat is greater over that part of the body than any other. Nausea and vomiting are more or less severe; the patient drinks large quantities of cold fluid, although he knows it will produce an increase of pain, and perhaps will be immediately vomited. The most extensive inflammation, and disorganizations of various kinds, may be going on in the mucous membrane of the stomach, and bowels, without producing redness of the tongue or elevation of the papillæ. Nevertheless, when the tongue is in that condition, or when it is covered with small ulcers, or numerous fissures, or when it looks red and glazed, or as if skinned, with or without patches of white fur, we are enabled to determine that the lining membrane of the alimentary canal is in a diseased condition.

Appearances on Dissection.—It may safely be said that there is not an organ or tissue of the body which has not been seen disorganized in fevers, and particularly in inflammatory fevers; and after what has been stated, and from circumstances which are still to be stated, it is thought unnecessary to dwell at present on this subject.

Treatment of Inflammatory Fever.—Sydenham, whose works are among the greatest ornaments which medical literature possesses, recommended, above a hundred and sixty years ago, the same, or nearly the same practice, which stands good in the present day. He was led by his great wisdom and experience into a proper line of treatment, although he had not the advantage which we enjoy, of examining morbid appearances after death, to confirm his views. He had erroneous notions, it is true, in consequence of his imperfect acquaintance with morbid anatomy, but he was the first who pointed out the impropriety of treating all fevers alike, by shewing that different organs are affected in different cases. He point-

ed out also very precisely, that a fever requires different treatment in every stage as it advances. He likewise made pointed observations against the farrago of medicines which were generally prescribed, and his own plans were exceedingly simple. It was he who first introduced the plan of purging in fevers. His chief hope seems to have been on the lancet, laxatives, and opiates, the strict antiphlogistic diet, and allowing no solid food. If he could have proved his opinions by an appeal to dissections, it is probable there would not have since been so many changes in practice.

An emetic, followed by gentle laxatives; a bland liquid diet; small doses of the solution of the tartrate of antimony; and perfect quietness, will produce a cure in very slight cases. But in severe cases, it is necessary to open a vein, and take away as much blood as will make an impression upon the disease, without reference to quantity. Young practitioners are often prevented from using the lancet, because there is no decided fixed pain; but they may rest assured, that in fevers, and more particularly in inflammatory fevers, some internal part in particular is suffering, although it does not exactly appear to their inexperienced eyes. Local inflammation is often concealed by the general irritation and uneasiness which prevails; and it does not shew itself to a superficial observer till it has become very severe. But we must not bleed in the manner recommended by the French, at least in inflammatory fevers. Boisseau, urging the necessity of general bleeding, says, p. 99. of his work entitled Pyretologie Physiologique, Ed. 1824. "Less than 8 ounces should not be taken at each operation; but this quantity will rarely suffice, it is necessary in general to draw 12 ounces; one may carry it even to 16 ounces, in subjects of whom I shall speak, *but one ought never to exceed this quantity. It is better to repeat the bleeding.*" I would also beg to refer to the cases and dissections published by M. Andral, in the 1st vol. of his Clinique, in which the deplorable effects of similar undecided practice are too evident to require being pointed out.

The causes of the failure of bleeding in this, and other diseases, are: *First*, Most physicians order the precise quantity of twelve or sixteen ounces of blood to be taken from all adults,

without reference to sex, age, peculiarities of constitution, or the actual pathology of the disease. *Secondly*, By the long period which is allowed to elapse between the bleedings, the strength is diminished, valuable time is lost that cannot be recalled, while little progress is made in eradicating the disease. *Thirdly*, No difference is in general made between bleeding a plethoric individual, and one who is in the opposite condition of system. *Fourthly*, The period of the disease influences a pathological physician, while it does not one who never looks at the inside of a dead body. *Fifthly*, The good effects of a general bleeding are very frequently lost, by not following it up, in proper time, by a second evacuation; or *by local bleedings*, which are often found to be most efficacious. *Sixthly*, The good effects of bleeding are often marred by neglecting to employ contro-stimulation, and contro-irritation, as well as by loading the patient with too many bed-clothes, and by errors of diet.

The patient should be seen within a few hours after the first bleeding, and the operation should be repeated at a short interval, if necessary. If this be done, particularly if followed by laxatives, blisters, and the use of the tartar-emetic, it will rarely be necessary in an inflammatory fever, however acute, to bleed a third time. But if, at the second or third visit, we find the patient so well as not to require further loss of blood, we are not to conclude that he is out of danger; and it is necessary to impress upon the minds of students and young practitioners, that if they are to do good in such a case, the greatest attention must be paid at the very commencement of the disease: vigilance at this period will save much subsequent trouble and anxiety. When leeches are necessary, they should be applied as near the affected organ as possible. With regard to antimony, objections are very justly entertained against its use, when the stomach and bowels are either irritated or inflamed.

Some practitioners do not allow their patients to use fluids freely, particularly cold drinks; but I believe this is a most injudicious prohibition, and that they may, in general, be allowed to gratify themselves in this respect.

The practitioner should be regular in his visits in all acute

cases, as sick people watch the hours, and become impatient and dissatisfied till he makes his appearance; and he should be careful how he expresses himself, for one word, or even a slight alteration of countenance, may rob the patient of all hope.

When the state of collapse comes on in fever, the patient should be carefully watched, that he may have his nourishment and medicines at proper intervals, and that the heat of the body may be properly supported.

Stimulants are frequently necessary at the termination of this class of fevers; but nothing in the Practice of Medicine is more difficult than to determine, whether a stimulant given in such a case is to do harm or good. When it is given, let it be in small quantity, closely watching the effect. If I were compelled to state, whether more mischief would follow the exhibition of stimulants in every case, or withholding them, I could safely say, that giving them in every case would be highly prejudicial. For although marked benefit is sometimes produced by stimulants, yet I have more frequently observed mischief; they are most beneficial when exhibited to patients with either a compressible, or a very quick and irritable pulse, and to those who experience profuse perspirations.

CONGESTIVE FEVER.

This is a fever, in the most severe form of which the pulse and the heat of the skin are generally below the natural standard. In slighter cases, the extremities are cold, or have a tendency to be cold, while the heat of the trunk of the body is increased. The best examples of congestive disease, are to be found in those individuals who die in the cold stage of the intermittent and yellow fevers.* The existence of congestion is well displayed in the first stage of intermittent fever; and I have seen many cases of pure congestive fever succeed the

* Before I had an opportunity of seeing the true Asiatic cholera, and examining into its nature and seat, I was led to suppose it to be the purest example of congestive disease. But I shall show the error of this opinion when treating of that disease in the proper place.

cold stage of an intermittent, when full re-action could not develope itself.

Congestive fever is a common form of disease in this climate, and is usually denominated "typhus." It is a disease which Sydenham knew well, and treated in the most judicious manner, as will be seen by consulting Swan's edition, p. 567. After stating that the invention of the term "malignity," has been far more destructive to mankind than that of gunpowder, he describes as decided a case of congestive fever, as is to be found in any modern work.

This case proves, beyond all doubt, that Sydenham must have had very good notions of the pathological condition of the body, from the expressions he uses, as well as from the practice he employed.

"But if it be inferred," says Sydenham, "that there is some malignity in the case, not only from the purple spots, but also from finding the symptoms of fever milder sometimes than should seem agreeable to its nature, whilst, notwithstanding, the patient is more debilitated than could be expected for the time,—I answer, that all these symptoms only proceed from Nature's being, in a manner, oppressed and overcome by the first attack of the disease, so as not to be able to raise regular symptoms adequate to the violence of the fever; all appearances being quite irregular. From the animal economy being disordered, and in a manner destroyed, the fever is thereby depressed, which in the true natural order generally rises high. I remember to have met with an instance of this kind, several years ago, in a young man I then attended; for though he seemed in a manner expiring, the outward parts felt so cool, that I could not persuade the attendants he had a fever which could not disengage and shew itself clearly, because the vessels were so full as to obstruct the motion of the blood. However, I said that they would soon see the fever rise high enough upon bleeding him. Accordingly, after taking away a large quantity of blood, as violent a fever appeared as I ever met with, and did not go off till bleeding had been used three or four times."

This disease has been described by several tropical physicians, but particularly by Dr Jackson; and it was in warm climates that I first obtained correct notions upon the subject. But the profession is much indebted to the late Dr Armstrong, for the very excellent manner in which he has illustrated its nature and treatment.

Symptoms of Congestive Fever.—We shall find, upon inquiry, that the patient has had a threatening of indisposition for perhaps ten days, a fortnight, or even three weeks, pre-

viously to confining himself,—that his appetite has been gradually impaired, with irregular action of the bowels; and that he has occasionally complained of alternate chills and flushes of heat, till at length the chilliness prevailed. This is the history which we in general receive of the progress of the severe cases. Even in mild cases, the heat of the skin is diminished; the pulse is weakened, or it is oppressed, and beats perhaps not more than 50 or 60; the prostration of strength is very considerable; the tongue is in general moist, and more or less loaded; the patient is lethargic, rather than comatose, though coma may subsequently take place; he can be roused, but the sensibility is evidently diminished; he complains of giddiness, confusion of intellect, heaviness, pain or sense of weight, either at the crown of the head or forehead. The general functions of the body will be found to be more or less impeded; but disturbance of some particular organ, in general, manifests itself, and the symptoms must of course be thereby considerably modified, as in other febrile diseases. In congestive fever, as well as in others, the brain may be the seat of disease in one person; the lungs in a second; the liver and mesenteric vessels in a third; and so on, the disease being essentially the same, but modified according to the principal seat of the congestion.

In congestive fevers there is generally a peculiar expression of countenance,—it looks besotted; the manner of the patient is undecided, with an appearance of carelessness, and his words seem, as it were, to hang in his mouth; the cornea looks dim; the pupil, in the first stage, is rather dilated, and is not much affected by light. If the patient attempt to walk, he staggers like a drunken man. There is always more or less prostration of strength, and in severe cases, he is unable to stand upon his legs, or to move his hand to his head, even from the first. The respiration is short, quick, and weak. He often signifies that he has a great load in the præcordial region. As the disease advances, he becomes more and more comatose; picks the bed-clothes; and is always found lying upon his back, slipping down by imperceptible degrees to the foot of the bed; the surface becomes more cold; the breathing more difficult; the face assumes a leaden hue; and occasionally, though

rarely, convulsions take place; sometimes there is nausea and vomiting, and sometimes diarrhœa; most frequently, however, the patient is constipated.

It may be shortly mentioned, that the appearances on dissection are much the same as those described in intermittent fever.

With respect to the causes, they are the same as in other fevers; but I have seen several very severe cases produced by bathing in the sea, and remaining too long in the water; by taking a drink of cold water; and by a weakly person exposing himself to a damp, cold wind, when his body had been previously heated.

Pathology of Congestive Fever.—No one can tell which is the first link in the chain of diseased action. The balance of the circulation may be destroyed, and congestion thereby produced, upon hearing disastrous news, which, some say, proves that a peculiar action in the brain is the first phenomenon; but then, exactly the same circumstance may happen from taking a cold drink, or remaining too long in the water when bathing. Therefore, it must be confessed there is much ambiguity about this part of the pathology. But it is unnecessary to go over the same observations which were made when treating of intermittent and other fevers, further than to state shortly, that when the head is the chief seat of congestion, there are early symptoms of lethargy, coma, and a diminution of sensibility, frequent chills, followed by other well known nervous symptoms, and occasionally by convulsions. When the heart and lungs are loaded, there is an oppressed, irregular, or intermitting pulse; weak and hurried respiration; cough; marks of impeded circulation in the face, and a difficulty in supporting the heat of the body; and in some rare cases, violent pain in the region of the heart, and along the arms, is complained of. It may be remarked, that whenever the pulse feels weaker than natural in a severe disease, it is an excellent plan to place the ear to the region of the heart, for we shall often find it acting most powerfully when the pulse is weak in the extremities. When the congestion affects the viscera within the abdomen, there is generally a sense of fulness and distension about the stomach; the bowels are irregular, being

either too loose or bound; and in either case, when stools are procured, they are found to be clay-coloured and very fetid, with very little bile, or very dark.

This opportunity may be seized for the purpose of noticing the most probable means which the animal system possesses, to prevent the balance of the circulation from being lost. *First*, There is a power possessed by all animals, of preserving to a certain extent a proper degree of heat under every condition of atmospheric vicissitude,—thus the heat of the body is not a degree higher under a burning tropical sun than in this country, which so far prevents cold from producing a lost balance of the circulation. *Second*, The elasticity of the coats of both arteries and veins, tends also to prevent the state of congestion, because they are capable of considerable distension, and are still contractile. These are assisted by the free anastomosis which subsists between the vessels of a part. This is well illustrated by the experiments which have been performed on the frog's foot, to determine the nature of inflammation. When a part is first irritated, the momentum of the blood is greatly increased; at last a vessel becomes obstructed, a globule of blood cannot pass through it, but it is seen to make a retrograde movement, and to find its way by another branch.

The pathology of this fever is happily illustrated by comparing the symptoms with the phenomena which occasionally take place in eruptive fevers, and to which I shall now make only a short allusion. In some cases, when the eruption is tardy in making its appearance, alarming symptoms, and even convulsions, take place. After the eruption has made its appearance, it sometimes suddenly and prematurely disappears, when congestive symptoms occur. Let the inquirer ask himself, where has the blood receded to, which a moment before rendered the skin as red as the shell of a boiled lobster?

Treatment of Congestive Fever.—In considering this part of the subject, it is very useful to remember the efforts which are made by the powers inherent in the constitution to remove internal accumulations of blood, if they be in any way short of that degree which kills the patient instantly. The first of these, and the most common, is the state which in medical

language is called re-action, which in its turn may create inflammation of the organ most affected with the congestion. We have next increased secretion, as a natural means of removing the congestion.

In the treatment of all diseases, the physician has to determine whether it will be most advisable to leave the case to the natural efforts of the constitution, assisting them a little in their operations, or whether he is by a bold decisive measure to step in to relieve the system at once. In this case, he is apprehensive that the heart and other vital organs may be too much overloaded and oppressed to create *full* re-action, or that the system will sink under the task. He has also to fear the effects of the re-action, which may terminate in extensive local inflammation. Anxious to escape these evils, he will follow the plan pursued by Sydenham in the case recently quoted, and he will open a vein with a view of at once restoring the lost balance of the circulation. The quantity of blood necessary for this purpose, in any given case, cannot be previously estimated. A stimulant may be at the same time necessary, to rouse the action of the heart a little, and make the blood flow from the orifice. I have frequently proved, before a number of witnesses, that it is not inconsistent with good pathology to bleed and stimulate at the same time.

When a vein is opened, the blood will perhaps only trickle down the arm at first; on other occasions it will spring from the orifice in a large stream, and suddenly stop before a tablespoonful is evacuated. Some think this is owing to an alteration in the position of the arm,—others, to the tightness or slackness of the bandage. Physicians frequently attribute this phenomenon to debility, and they take it as the most certain sign that the patient will die in their hands, were they to carry the operation farther. But it must be recollected that the blood is moving very slowly in the arteries, while the veins are gorged. When an opening is made in the vein, it suddenly empties itself, and as a supply is not quickly at hand, it is some time before the blood begins again to flow. Let the finger be placed on the orifice, the vein will be filled, and the blood will spring again. Heat is also to be applied, and if possible, the patient should be placed in a warm bath; if that

cannot be obtained, the feet and legs should be plunged into very warm water, and hot bottles placed round the body. The patient is to be rubbed with stimulating fluids, such as heated spirits of turpentine, and aqua ammoniæ; drachm doses of ether may be given, or a solution of the carbonate of ammonia, in the proportion of eight or ten grains to an ounce of water. He should be encouraged to drink warm fluids. The caution and discrimination which ought to be pursued in drawing blood in such critical circumstances, need not be insisted on; suffice it to say, that a stimulant ought to be at hand, and a finger should be on the pulse of the opposite arm, to watch the effects of our practice.

If every thing go on well after the bleeding, the bowels being in a proper state, two grains of calomel and one of opium may be given in a pill, and repeated every three or four hours.

General bleeding is admissible only in the earliest stage of congestive fever, unless in cases in which the pulse is still strong and full. Should the proper time for V. S. have passed, stimulants are sometimes found serviceable, but must be administered with caution, and relinquished for perhaps debilitating remedies, upon the first appearance of re-action. If, at any time in the subsequent progress of the case, there should appear signs of local disease, the application of leeches and blisters should be had recourse to; and the patient is to be treated during convalescence in the same manner as in any other fever.

MIXED FORM OF FEVER BETWEEN THE LAST-MENTIONED THREE, BUT IN WHICH CONGESTION PREDOMINATES.—THIS IS USUALLY DENOMINATED TYPHUS AND SYNOCHUS.

In the disease which is now to be sketched, there is a combination of the last three described fevers, appearing under three forms:

1*st*, Severe cases of congestive fever, in which there is slight or suppressed re-action, followed by inflammation.

2*d*, The functional fever, subsequently united with conges-

tion, and consequent accumulation of blood in different organs; this forms, I apprehend, the Typhus of authors.

3*d*, The inflammatory fever, subsequently united with congestion; this is the Synochus of authors.

As to the first variety, it has been fully explained in the last article, and the same remarks need not be here repeated.

The second variety begins in the manner which has been already described in fevers from functional derangement, but subsequently, an accumulation of blood takes place in the centre of the system. When the circulation becomes so much embarrassed, all the symptoms of congestive fever take place, the patient having been debilitated by the previous diseased action.

The third variety commences in the manner which has also been already described in inflammatory fevers, but subsequently the balance of the circulation becomes more and more lost, and congestion follows; in which state of the system, the inflammatory action is suppressed, but not extinguished. This takes place when debility and exhaustion have been already produced by the previous disease.

The brain, lungs, and organs in the abdomen, are liable to be implicated, and in the worst cases which occur, they generally are all affected, either simultaneously or in succession. Hence there is a complication of symptoms, and as the disease principally affects the poor, who are ill clothed and badly fed, and as medical advice is not in general sought during the first stage of the disease, we usually find it very difficult to manage.

In the early stage of the second variety, and when alone any thing like active practice should be had recourse to, the symptoms certainly denote debility, which are as yet occasioned by oppression and obstructed action only; and often have I seen cases immediately and permanently benefited by drawing blood, in which, had the operation been postponed for twenty-four hours, it would have been quite inadmissible. It may likewise be remarked, that much of the oppression and debility also depends on the condition of the lungs, which, besides being congested, and therefore unable to perform their functions properly, are subsequently still further embarrassed by

an inflammatory affection of the bronchial tubes. Both these conditions tend to prevent the changes in the blood, which are well known to be elaborated in the lungs; therefore, all organs must suffer additionally, and the brain of course among others. The bronchitic affection in fever has attracted my attention for many years, and I am led to believe, that few instances of febrile affections take place, without bronchitis appearing in some stage of the disease, and very often it is the primary affection. In all the fevers which are called putrid, and which are accompanied by dark-coloured spots on the surface of the body, termed petechiæ, it will be found, I am almost inclined to say invariably, that bronchitis prevails to a great extent. The somewhat livid and circumscribed redness which is seen so often on the cheeks in the fevers called typhoid, is principally owing to the embarrassed state of the lungs; and exactly the same circumstances take place in synochus.

In the third variety, bleeding may be had recourse to with benefit, later in the disease than in the others, and often have I seen it decidedly beneficial when cases were going wrong under the injudicious use of stimulants and tonics. In proof of these statements, the reader is referred with confidence to Dr Mason Good's account of typhus, in his second volume, (from page 230 to 258.) According to his views, this, being "a disease of sensorial debility, leading on to putrescency," is to be treated by tonics; "bleeding and purging are among the foremost objects of prohibition." Nevertheless, in the next page, the following contradictory statement is advanced; "hence the fever will be aggravated from local irritation, and the affected organ will be in danger of inflammation, if not of gangrene."

There is no class of diseases in which the stethescope is of more practical advantage than in fever, for, as has been already mentioned, the heart may be found beating violently, whilst the pulse at the wrist is so weak as scarcely to be felt, and when symptoms of general debility appear to be very great, and the extremities cold. To a patient in such a state, most medical men would naturally be led to give wine, beef tea, and animal jellies, which they would not do if they were aware that the action of the heart was strong. During the last twelve years, I have seen many severe cases of fever, in which

marked benefit was produced by withdrawing stimulants, and the patients have ultimately recovered after being leeched and blistered. Let it not, however, be supposed that I am an enemy to stimulants in all cases of fever; on the contrary, I have seen patients occasionally snatched from the grave by their judicious employment. What is wished to be impressed upon my readers, is, that in all fevers we have to dread local congestions and inflammations, more than debility and putridity. That I am in the habit of using stimulants in fever, I can appeal to the gentlemen who have been my pupils, and who have witnessed my practice, who can at the same time verify the following statement;—that much mischief has occasionally followed, and that therefore I feel fully as anxious about the result of a stimulant as a bleeding. When a stimulant is necessary, wine is the best; and experience has taught me, that wine, or any other stimulant, is far less likely to do harm than beef tea and animal jellies.

Cases can no doubt be quoted, where stimulants, in large quantities, have been administered from the beginning of the disease, and the patients have recovered. But the best way for any one to come to right conclusions regarding this question, is, to judge from the general result of what he has himself seen. I have had many opportunities of observing that recoveries were slower, and relapses more frequent, in cases treated upon the stimulating plan, than the antiphlogistic.

Emetics cannot be too highly extolled in the last stage of some cases of fever, particularly the varieties called typhus and synochus, but only in those in which the bronchial tubes become filled with muco-purulent matter. This happens in consequence of the patient being too long asleep, or not coughing up the matter before too great an accumulation has taken place. Many of my friends have seen the happy results of administering emetics in such cases, and more particularly, my dispensary pupils will not forget many instances of this among our poor patients during the late epidemic fever in Edinburgh.

Cleanliness, free ventilation, and quietness, are three great and essential circumstances to be attended to in the treatment of fever. The alvine evacuations should be removed instantly

out of the room; and it is of great consequence to attend that the quantity of bed-clothes be not too great in the first and second stages of fever when the skin is parched, or too small when the patient is approaching to the state of collapse. The extremities should be examined at every visit by the physician, as sometimes the symptoms are aggravated in consequence of cold limbs, which will perhaps require no other remedy than the application of heat. The state of the bladder should be attended to, for although the urine is generally suppressed, yet occasionally it is not so. The temperature of the room can scarcely be too cold in the first stages, but much injury has been produced by keeping it too low in the stage of collapse. Many patients have been strikingly benefited in less than half an hour after their bodies were made warm, and perhaps their lives ultimately saved, without the assistance of any other means. Some owe their death to being removed from a warm and ill-ventilated room into the cold ward of an hospital; so frequently has this happened, that I am obliged to run all hazards from bad air, bad nursing, and filth, rather than send my patients to the Infirmary of Edinburgh, which is ill constructed for any class of patients whatever. The sick are also badly classified, which is perhaps no fault on the part of the medical attendants, who ought to be well aware that the temperature of a ward calculated for fever cases in the first stage, is too cold for those in the last. Every fever ward of great extent should be warmed by means of heated air, and provided with water closets for the use of convalescents.

For a considerable time it baffled me to account for the discrepant histories of fever which have been handed down to us, and for the confidence with which opposite practices have been recommended to our notice; but further experience has convinced me, that this discordance of opinion may be accounted for by one or other of the following circumstances:

1*st*, A difference in the character of the prevailing epidemic, and the constitutions of the persons affected; for example, a functional fever will bear stimulating remedies which would kill a person labouring under an inflammatory fever, particularly if the inflammation affected a vital organ. A stimulant

given in congestive fever may operate beneficially; whereas in functional fever, or in inflammatory fever, it would be very injurious. A well fed, and previously healthy soldier, who has no cares, will in general have a high-toned fever; whereas a poor, ill fed, and badly clothed labouring man, worn out by cares and anxieties, and living in an ill-ventilated and filthy apartment, will be affected with one of an opposite character.

2*d*, An arbitrary and too often empirical practice, which has hitherto been too frequently followed. One physician always bleeds in every case of fever,—another stimulates; and when the results are analyzed, perhaps it will be found that the proportion of deaths is the same, and even these results will vary to support the one practice or the other, according to the habits and constitutions of the patients: For instance, if our army and navy surgeons were to stimulate throughout the course of the fevers they have to deal with, they would scarcely save a patient; and if practitioners entrusted with the care of the sick poor were to bleed all their cases of fever, they would be quite as unsuccessful.

3*d*, Writers are too often guilty of an error which all medical men are liable to commit, viz. of mixing up their own opinions with matters of fact in their statements.

4*th*, The prevailing habit of drawing sweeping conclusions from one or two facts.

5*th*, Unphilosophical attempts to bolster up erroneous views by special pleadings.

The proportion of deaths in fever, in my Dispensary practice, from the beginning to the termination of the last severe epidemic in Edinburgh, was as follows:—Out of the first hundred and forty cases, there was only one death. This patient was anxiously attended by a highly respectable practitioner in this place, who was then my assistant; he died during a relapse after he had sat up. The proportion of deaths, however, subsequently increased, so that in November (1827) the calculation of deaths was 1 in 37. This includes several individuals who were in the last stage before we were applied to; also the case of a girl who died during a relapse from accidental loss of blood after the application of

leeches; an old Highlander, who would take no other medicine than his own mountain dew; and an old woman, above 60, who, when convalescent, took a shivering fit, and died immediately.

The appearances found on dissection, in our fatal cases, were as follows:—In two cases there was well marked arachnitis, viz. by extensive effusion of coagulable lymph, which was deposited between the arachnoid and dura mater. In both there was great vascular turgescence; some effusion into the ventricles; and in one of these there was white ramollissement in the centre of the brain. In two men, and one old woman, the vessels of the brain were found very much gorged with blood, and the pia mater, throughout its whole extent, had its vessels amazingly distended with dark blood. The preparations were dried on glass, and can even now be seen in this state. In these three last-mentioned cases there was some effusion under the arachnoid, and the ventricles; and on slicing the brain, an unusual number of large bloody points were observed: there was also bronchitic effusion, and in one of them a considerable portion of the lungs was in a state of softening, and intensely red. In the old woman who died so suddenly during a rigor, when apparently convalescent, there was little disease in the mucous membrane of the stomach and bowels; but in one of the men, there was extensive vascularity of this membrane, but no ulceration; the mucous membrane of the stomach was much corrugated, and the whole of the splenic extremity was studded with red points, which were seen through a great quantity of thick viscid mucus, which being washed off, and the stomach stretched, these red points were discovered to be vessels, which existed in immense numbers; the vascularity was greater, however, in the mucous membrane of the bowels, particularly throughout the whole of the ileum, and a great part of the colon. In the other man, when the abdomen was opened, the small intestines had a black appearance, as if in a state of mortification; they were found filled with a bloody-looking exudation, which, from its weight, had borne them down into the cavity of the pelvis. It was thought at first that this matter was the sole cause of the discoloration; but upon cutting open the intestine, it was

found that they owed this colour principally to great vascularity; there were no ulcerations. There are dried preparations, and drawings of the appearances in this case, in my museum. In other cases, there were ulcerations in the ileum and colon, of which also the preparations and drawings are in the museum; and I am inclined to believe, that if these appearances were properly looked for, they would be more frequently seen. In one case, the left kidney was enlarged, as well as the ureter; its pelvis, on being cut open, was found to contain about six ounces of pus, and the inner membrane was very vascular. In the body of the old woman, who, it has been above stated, died suddenly during convalescence, the chief diseased appearance was, that both lungs were found as black as they usually are when affected with melanosis. I was not at the dissection, being engaged at the time in delivering a lecture; but Dr Crellin, who conducted the examination, sent for me, and it was proved to the satisfaction of all present, that this appearance was not melanotic, but produced by venous engorgement. I had never before seen the whole of both lungs so completely engorged; they sank in water, but after being washed, they regained not only their natural appearance, but their proper degree of buoyancy. The characters of the ulcerations shall be stated in the second part of the work, when treating of inflammation of the mucous membrane of the stomach and bowels.

HECTIC FEVER.

Hectic fever is generally supposed to be symptomatic; even Cullen embraced this opinion. It may be defined to be febrile symptoms occurring in the course of some internal chronic disease, when the patient is much debilitated. Heberden states that irritation in any diseased organ will give rise to it. An opinion has been pretty general, that hectic fever is produced by no other cause than the absorption of pus; and when pus was not found upon dissection, it was hastily

concluded that it had existed, but was all absorbed; or that hectic fever is sometimes idiopathic. My own belief is, that this combination of symptoms has no necessary connexion whatever with pus; and according to my experience, it most frequently (although certainly not always) depends on inflammation of the mucous membranes, and more particularly that of the stomach and bowels.

Symptoms.—Hectic fever is attended with great and increasing debility; a weak quick pulse; each paroxysm commences with chilliness, succeeded by re-action, which is soon followed by copious perspiration. Indeed, sweating is at all times easily excited by any exertion. The surface is pale, except the cheeks, which present what is very aptly styled the "hectic blush;" and there is frequently great wasting of the muscles. The appetite is impaired, the stomach occasionally very irritable, and in nine fatal cases out of ten, diarrhœa comes on during the course of the disease. The discharge from the bowels is always very fetid. The breathing is anxious. The patient is generally restless, and frequently complains of pains that are ascribed to rheumatism.

It is said that this disease is liable to be confounded with intermittent fever; but the history of the case, and the appearance of the patient, will readily distinguish them.

Treatment.—As hectic fever depends upon a morbid condition of some structure of the body, our attention must be directed to the seat of the disease. Surgeons very often cure patients of hectic fever, by cutting off a diseased limb which had produced the constitutional symptoms. There is no case in which the difference is so strikingly shewn between routine practice, and that which is directed by sound pathological views. The routine practitioner will be invariably found to treat some of the symptoms thus;—Has the patient no appetite? Give him a tonic.—Is he purged? Prescribe an astringent.—Is he griped? Give him an opiate.—Is the urine scanty? He must have a diuretic.—Has he profuse perspirations? Let acid drops be exhibited!

A pathologist, it must be admitted, is often obliged, in the present state of our knowledge, to act empirically; but his remedies will always be found to be few in number. If the

patient have diarrhœa, he will endeavour to ascertain upon what morbid state that symptom depends; if there be pain in the abdomen previous to an evacuation, if the pain be increased by taking a cold drink, if the tongue be red and glazed, if there be apthous ulcers in the mouth and throat, if the stools are mixed with mucus, or are watery and fetid, he knows he has to treat inflammation, and probably ulceration of the intestines. This leads him to apply a few leeches to the abdomen, if the patient's strength be not greatly reduced, followed by contra-irritation; and then, if there be any remedy that he knows will relieve the patient, that remedy he will prescribe. It is truly lamentable to see the symptomatical physician, one day treating the diarrhœa with astringents, and the next waging war against the perspirations.—This subject will be more fully illustrated hereafter. Opiates are frequently of considerable use in soothing the patient's sufferings.

GENERAL PATHOLOGY OF ERUPTIVE FEVERS.

The diseases which fall to be described under this head, are to be considered as fevers, attended during part of their course by eruptions. Whatever difference there may be in the appearance and form of the eruption, they have a certain general character common to all, viz. that febrile symptoms precede the eruption.

According to the humoural pathology, the fever is produced by a concoction of the humours, by which a peccant matter is thrown to the surface, forming the eruption. Other pathologists look upon these diseases as peculiar and essential affections of the epidermis, sometimes *followed* by inflammation of the chest and its accompanying fever; and they account for the sore throat which occasionally occurs, by its continuity between the skin and the diseased internal organ.

My own opinion is, that the eruption ought to be regarded as a mere symptom of this class of diseases. Yet it cannot

be denied that there is something very peculiar in it,—peculiar in as much as the eruptions present external characters, differing from each other, as well as from other eruptions, and that the diseases occur only once in a lifetime. After a long and patient investigation, comparing the symptoms with the appearances found on dissection, I have come to the opinion, that the mucous membranes are the seat of the disease, the nature of which is inflammation, more or less acute and extensive; and that the part generally most implicated, is the mucous membrane of the lungs, particularly in Measles and Small-pox; while that of the bowels is the part chiefly, if not principally, affected in Urticaria, Roseola, and Miliary Fever. The eruption is merely to be regarded as a symptom, and by no means a universal symptom. It is well known that many cases of Eruptive Fevers are very mild, and require little treatment, while others are extremely severe and fatal; and that a great deal depends upon the eruption, whether it comes out at the usual period, and whether it remains out, or prematurely and suddenly recedes. The eruption, in point of fact, ought to be regarded as a natural blister, acting as a contra-irritant. It is produced by powers inherent in the constitution, that enable it to remove so much of the diseased action from an internal organ, the functions of which are more immediately necessary to life. In slight cases, I conceive the eruption is in proportion to, if it do not exceed, the amount of the internal disease. This may be stated without reference to the quantity of the eruption, except perhaps in Small-pox. There can be no doubt that the eruptions are produced by inflammation of the cutis, which consequently must take off so much of the determination of blood, and so much of the diseased action from internal organs.

These circumstances, it appears to me, are clearly proved,

1. By attending to the constitutional commotion and oppression of the whole system, and the morbid changes in the functions of various organs, for many days before the appearance of the eruption.

2. By the relief afforded, in general, after the free developement of the eruption.

3. By the increased suffering and danger which exist when

the eruption is deficient, or when its repulsion suddenly and prematurely takes place.

4. By the relief which follows proper treatment; and,

5. By the appearances observed on dissection.

With respect to the first of these points, it may be stated, that the eruption does not appear in general till the third, fourth, or fifth day of the complaint, and during that time, the patient labours under the combination of symptoms denominated fever, and suffers from the impeded functions of all organs; all the symptoms denote internal disease. That the respiratory organs suffer very considerably, may be discovered by the state of the respiration, the cough, the anxiety and colour of the countenance; but more particularly by auscultation, which will announce bronchitis in its first stage. In this stage, which is called the eruptive, there are frequently affections of the brain, announced by the patient suffering from delirium, lethargy, or even coma; and it is by no means uncommon to see convulsions, or other serious nervous symptoms, come on, at the period when the eruption ought to have been fully developed, but has not yet appeared, or has only partially come out.

As to the second point which has been offered in proof, it is to be observed, that the symptomatical physician will not be inclined to receive it as evidence in favour of the views which I wish to establish. He will say there is no relief; and in so far he will say truly. The eruption being occasioned by extensive inflammation of the skin, produces great irritation, and very often an increase of the febrile symptoms; that is to say, the person will complain more of thirst, restlessness, and uneasiness, than previously. But still a pathological eye will discover relief,—relief produced by the translation of a part, and perhaps a great part, of the diseased action from internal organs to the surface. The symptomatical physician will point out to us that the respiration is still hurried and short, but we may be able, after an examination of the lungs, to assure him that there is less congestion of the lungs, and less inflammatory action in their mucous membrane, than before; and that the state of the respiration which he has noticed, is now produced principally by the hurried circulation through

the lungs; so that, pathologically speaking, the patient is relieved. A common blister, when it is sufficiently large, very frequently increases the patient's sufferings, while it has mitigated the disease.

The third point of proof is the acknowledged danger which exists when the eruption is deficient, or when its repulsion has taken place. Dr Gregory, in his lectures, when treating of Scarlatina, used to make the following statement: "We find a connexion similar to that between the efflorescence and other symptoms in this disease, existing between the eruption and general affection in Measles, for there it is not critical, but is accompanied with an alleviation of the symptoms, which is greater or less according to the degree of the eruption; and all the symptoms are very much aggravated by the repulsion of it." Indeed, if the reader will refer to any author who has written upon this subject, he will find, that in the severe forms of the disease, which are commonly described under the terms *Scarlatina Maligna*, *Scarlatina Anginosa*, and in *Rubeola Putrida* also, the eruption is either wanting, or it appears at irregular periods, but is seldom permanent; and it is in these severe cases that we meet with what are called typhoid symptoms, diarrhœa, and hæmorrhage from the nose, mouth, or bowels. The first question which it is natural for an inquirer to ask, is, By what cause is the danger produced? It appears to me, that the reply is very easily made. There has been lately an extensive inflammatory action in the skin, which required a determination of blood to support it. During this time the symptoms were not very severe; but the moment that the blood forsook the surface, it was marked by increased internal distress; the respiration became more laborious, and the patient more or less comatose; perhaps convulsions appeared. Is it not quite natural, therefore, to conclude, that these effects are produced by the sudden determination of blood taking place towards internal parts, producing engorgements, and ending in inflammation of one or more organs, if the eruption be not speedily brought back? But it will frequently be that kind of inflammation which has been described as "suppressed," and which cannot fully develope itself. The external symptoms will lead a symptoma-

tical physician to stimulate and give tonics, when the pathologist would try the effect of the warm bath, stimulating frictions, and bleeding by leeches, if he could not open a vein; and he would also apply blisters.

The fourth point in the evidence, is the relief afforded by proper treatment. When the eruption is repelled from the surface, we use all the means within our power to recall it; the warm bath and stimulating frictions are first employed. The warm bath, which is the principal means to be depended on, may not be at hand, or we may have tried these remedies and failed; but we ought not to delay long under any circumstances, to open a vein, if the eruption be not speedily reproduced, particularly if the patient be above two years of age, and a vein can be found; if not, we must depend upon leeches, warm bath, and blisters. By opening a vein, however, we prevent a great deal of mischief and risk to the patient. If we cannot recall the blood to the surface, we reduce the quantity of it in the whole system, and thereby remove the accumulation from internal organs, alter the determination of blood, and then assist the system in creating re-action, if necessary, by the addition of a stimulant. But all this, to produce benefit, must be done instantly; every moment lost, diminishes the chance of relief. I am entitled to speak strongly, from the great success which has attended the treatment here recommended, not only in my own practice, but also in that of many of my pupils. Although many of these cases might be quoted in detail, yet the perusal of the following case, translated from the Clinique Médicale, by M. Andral, vol. iii. p. 72. will perhaps make a sufficient impression upon the minds of my readers. This case is entitled, "*Acute bronchitis; Measles; Premature disappearance of the eruption; Fatal dyspnœa.*"

"A baker, æt. 20, of a strong constitution, was affected within the last five or six weeks with slight diarrhœa; presented on the 10th April all the precursory symptoms of measles, redness of eyes, flow of tears, coryza, hoarseness, cough; and continued in this state for the three following days. On the 14th, the eruption appeared, and the patient took to his bed. On the 15th, his whole body was covered, and in

the evening he was admitted into the Charité; when he had a confluent, well-marked eruption; hardness and quickness of the pulse; redness of the tongue and lips; and a strong cough; there was otherwise no alarming symptom. Towards the middle of the night, the patient experienced, all of a sudden, an oppression, which rapidly increased, and on the following morning we found him in a state of partial asphyxia; the eyes prominent; the face of a violet colour; respiration short and very frequent; cough nearly constant; little mucous expectoration. Percussion elicited the natural sound through the whole of the chest, but the mucous rattle was audible, in different points, by means of the stethescope. There remained only a few pale spots of the cutaneous eruption, which were fast dying away. The pulse preserved its frequency and *hardness*, and the tongue its redness. This train of symptoms seemed to indicate the existence of pneumonia; nevertheless the pathognomic signs of this complaint were completely wanting.

"Could a simple bronchitis occasion, by its extreme acuteness or sudden exasperation, so much dyspnœa? and might not this inflammation, joined to that of the alimentary canal, account for the complaint with which the patient had been so violently attacked? Be this as it may, the indications of treatment were clear;—to lessen the internal inflammation,* and *to effect a return of that on the skin*. With this object, twenty leeches were applied to each side of the chest, and ten to the epigastrium. After the blood had ceased flowing, a blister was applied to each leg, and the skin rubbed all over with liniment of ammonia. Marked relief followed the use of these means; in the evening the respiration was much less impeded, the cough less frequent, and the tongue had lost its redness. The eruption, however, had not returned.

"17*th*, The patient presented the symptoms of a severe

* Had the distinguished author used the term "congestion" instead of inflammation, and had he employed V. S. without delay, instead of applying leeches, he would have altered the determination of blood, and probably relieved the diseased organs. This ought to have been his practice, from the hardness of the pulse.

bronchitis, accompanied with fever; the respiration was only slightly accelerated.

"18*th*, The fever was reduced to almost nothing, and the opaque expectoration announced the speedy termination of the bronchitis. In the evening, the respiration suddenly became very difficult, and twelve ounces of blood* were abstracted from the arm. The next morning the dyspnœa was still very considerable, and the pulse had become more quick. Two blisters to the thighs. During the whole of the day, the sense of suffocation continued to increase.

"20*th*, Face extremely livid, violet colour of the lips, orthopnœa; from the appearance of the patient, one would have thought that he was dying of aneurism of the heart.

"*Inspectio cadaveris.*—The mucous membrane of the larynx, trachea, and bronchial tubes, and of the smaller ramifications, were of a scarlet red. In a few points at the beginning of the division of the bronchia, there were some white concretions, resembling the false membrane found in croup.

"The lungs were sound and crepitated throughout their whole extent, posteriorly they were gorged with blood. Heart natural; clots of blood of a deep black in the right cavities; stomach white, as well as the small intestines, which contained a great number of ascarides and lumbrici in the lower portion; the cæcum contained several worms, (tricocéphales); its mucous membrane presented a red spot near the valve, from which arose three or four small conical vegetations, three or four lines long. The rest of the large intestine white, and filled with liquid feces. Liver gorged with blood. Spleen large and firm. A great quantity of serum infiltrated into the sub-arachnoid cellular tissue; the cerebral substance was not at all injected; the lateral ventricles, especially the right, were distended by much limpid serum."

The fifth point of evidence rests upon the appearances found on dissection; and it may be shortly mentioned here, that these consist of all kinds of lesions of the brain and membranes, usually produced by acute and sub-acute inflammation. The same observation may be made respecting the organs in

* It is to be regretted that this was not done two days earlier.

the thorax. Within the abdomen, the chief diseased appearance to be observed is in the mucous membrane, particularly of the large intestine, which is inflamed, sometimes ulcerated. But in no case does the pulmonary system escape. The appearance in the brain and abdomen are not so universal, and may occasionally depend upon the impeded functions of the lungs, as will be shewn hereafter.

If these observations be not fallacious, bleeding to a sufficient extent ought not only to relieve the constitutional symptoms during the eruptive fever, but after the eruption has appeared, ought to destroy it. Observations and experiments frequently performed and repeated by myself, and by my pupils, enable me to state, that these are facts, which I shall not be afraid to repeat before the highest authorities in the profession, and stake my professional reputation upon the general result of the plan; having already seen recoveries take place, under this treatment, in cases in which such a happy termination was scarcely to be anticipated. It also follows, if these things be true, that even in ordinary cases there are two periods more critical and dangerous to the patient than any other; these are, the period at which the eruption ought to make its appearance, and that at which it should naturally disappear. In the first case, the internal disease has gradually become extensive and severe, and wants relief by means of the eruption. In the second, the disease which had existed at first, having been relieved by the external irritation, is now in danger of being re-produced by its cessation; and this of all others is the period at which, in the slightest form of the disease, the patient stands most in need of care and vigilant attention to the condition of internal organs.

This pathological description, if it should appear deficient, is so only, I am convinced, from the want of sufficient illustration, which would require a separate treatise on the subject. It is introduced in this place to prevent repetition, when treating of each of the diseases which fall now to be described.

SCARLET FEVER.

This term is employed to denote a disease attended by a fever, sore throat, and a red rash on the surface, which rash appears sometime between the second and fifth or sixth days of the disease, first upon the face and neck, and progressively spreads over the body, terminating between the seventh and tenth days. The rash has very much the appearance of the shell of a boiled lobster, and frequently there are minute vesicles. The inflammation of the throat sometimes runs into ulceration and sloughing.

The literary history of this, or of any other disease, is of little importance in comparison to an intimate acquaintance with its pathology, and proper means of treatment. Therefore I shall proceed to describe the phenomena, without caring from whence the disease came, or in what century it first appeared, further than to notice that Scarlatina and Measles were formerly confounded, from their mutual pathological resemblance. Sydenham appears to have been the first who gave this disease the name of scarlet fever, as well as a distinct description of the affection, pointing out the circumstances, with sufficient precision, in which it differs from Measles.

The term Scarlatina, notwithstanding the philippic of Dr Mason Good, is quite as good as his term "Rosalia;" it affords us an example of what is by no means rare, a disease receiving its name from a single symptom.

Scarlatina has been divided into three species, viz.

Scarlatina simplex.

——— anginosa.

——— maligna, which last includes the disease termed Cynanche Maligna. My chief objection to these terms is, that they do not spring from pathological considerations; and it may be said in the language of Dr Hamilton Sen. (not the Professor,) that "it is altogether foreign to my purpose to engage in this controversy; and more so, as the distinction begins to lose ground as our knowledge of the disease becomes more comprehensive and accurate. The time may not be far

distant, when scarlatina will be received as the generic disease, the full history of which will include the more aggravated symptoms as they appear in scarlatina anginosa, and in cynanche maligna; in the same manner as the history of variola comprehends the varieties of the distinct and confluent small-pox."

Scarlet fever is a fatal disease, and more particularly so, it is said, in this city. The plague is scarcely more dreaded at Constantinople than scarlet fever is in Edinburgh; not because the disease is peculiarly severe, but that the notions taught in a dark age still prevail, and that certain individuals have not kept up their knowledge with the improvements since made in pathology.

Symptoms.—In eruptive, as well as other fevers, there are two great varieties, which may be named the congestive and the inflammatory; and sub-divisions might be made of different combinations of these two.

In the congestive form of scarlatina, the patient complains of oppression, and so much debility, that he cannot support himself. Rigors more or less severe accompany, or precede, these symptoms. The face is pale, the features sharp, the eyes hollow, and deprived of their accustomed animation; the surface cool, particularly the extremities, while perhaps considerable heat is felt on the trunk of the body; the breathing is performed with more or less difficulty; the pulse varies, being sometimes soft, and perhaps weak, although it is occasionally strong; the tongue has a whitish and shrunk appearance. If the patient utter complaint, it will be of universal prostration and of headache, or weight on the top of the head, together with oppression at the præcordia, and difficulty in swallowing. On examining the fauces, the parts may appear somewhat swollen, and of a dark colour; and should there be any ulceration, it will perhaps be ash-coloured, and look indolent. It may be stated, and with some plausibility, by that class of practitioners who are led only by symptoms, that those just described do not denote the existence of scarlatina; to which it may be replied, that one individual of a family will display such symptoms, while others are labouring under the disease in the ordinary form. Similar appearances have also come on in the course of scar-

latina, upon the sudden disappearance of the rash; and further, the cessation of the congestive symptoms has been witnessed upon the re-production of the rash; which phenomena have occurred so often, that I am compelled to receive them as part of the medical evidence. I have had one opportunity only of examining the body after death, in a subject who fell a victim to this form of the complaint. The throat was found to be very slightly ulcerated. There was considerable distension of the veins in the abdomen, the lungs were much congested, and the vessels of the head were remarkably full of dark-coloured blood.

The pure congestive disease is rare, but it is very common to see the mixed disease, that is, a combination of the inflammatory with the congestive symptoms.

The inflammatory form of scarlet fever generally makes its attack in the following manner:—rigors, or only slight chilliness, followed by more or less pyrexia, restlessness, want of appetite, thirst, want of sleep, headache, some degree of nausea, oppression at the præcordia; tongue at first slightly loaded, red, with raised papillæ; or it may be much loaded with a yellow fur, and intensely red at the tip and round the edges. Soreness of the throat is complained of, which is sometimes the first cognizable symptom; it is either slightly swollen and much inflamed, or of a dusky hue, without much swelling; ash-coloured ulcerations may often be discovered, but we must be upon our guard not to mistake exudations of coagulable lymph for ulcerations. In the generality of cases, there are evidences of sub-acute inflammation in the larynx and bronchi, which is announced by difficulty of breathing, cough, and hoarseness, and more particularly by auscultation; but the inflammation in the bronchial tubes is not so decidedly marked in all cases of Scarlatina, as in Measles and Small-pox. Sometimes there is delirium, but perhaps during the course of the night only, and sometimes some degree of coma. These symptoms may continue for 2, 3, 4, 5, or 6 days, before the rash makes its appearance. Sometimes, indeed, the eruption is the first symptom which announces the complaint, but this happens in the mildest cases only. In general, the eruption appears on the 4th or 5th day.

The eruption is of a scarlet colour, first to be observed on the face and neck, and in the course of twenty-four hours becomes pretty generally diffused, patches appearing here and there more intensely red than the surrounding parts; on pressing with the finger a white mark is left, but the redness returns in a moment afterwards.

After the eruption has existed from 3 to 5 days, it begins to decline, the cuticle subsequently separates and peels off. This is a very dangerous stage of the disease, and would be still more so, were it not that the eruption declines gradually, and that the circulation on the surface is still actively employed in the formation of new cuticle for the whole surface.

Dr Gregory, in his lectures, used to state, that "a copious efflorescence is a favourable symptom; when it is deficient the symptoms are more severe, and when it is repelled, it never fails to aggravate both the general fever, and the topical affection of the throat." "It is not an easy matter," continued he, "to explain the connexion which subsists between the efflorescence and the other symptoms; it is not critical, but all the symptoms are much relieved by its coming out copiously."

Occasionally anasarca, and more rarely ascites, follow in the first or second week, and are attended with constipation, scanty urine highly albuminous, languor, nausea, general uneasiness, and other symptoms which have been denominated Secondary Fever.

Appearances on Dissection.—In the dissections which have fallen within my observation, the inflammation and ulceration in the throat have not appeared so extensive and important as had been imagined before death. The most constant diseased appearances have existed in the air passages, presenting inflammation in its different stages; viz. vascularity of the mucous membrane, thickening, and occasionally ulceration; in two cases I have seen the epiglottis nearly destroyed by ulceration; and also effusion of thick, tenacious matter, filling up the air passages to the bifurcation, and often lining the trachea. Sometimes the substance of the lungs is seen inflamed, and occasionally the pleura, but traces of inflammation in these two tissues are not so frequently met with, and are to be regarded more as examples of acute action, extending from one tissue to

another by contiguity, than as forming essential parts of the disease. The lungs are sometimes so much gorged with blood, as to have lost in a great degree their natural appearance and buoyancy. In the brain there is sometimes arborescent vascularity, with turbid effusion between the arachnoid and pia mater, and the ventricles are occasionally filled with serosity. On opening the abdomen, the peritoneal coat of the stomach and bowels generally looks healthy, except in the congestive cases, when the smallest blood-vessels will be seen distended with dark-coloured blood. In different parts of the mucous membrane, we frequently see considerable vascularity, sometimes ulceration. The liver is often gorged, or soft in texture.

" From a cautious survey of the symptoms during life," says Dr Armstrong, in his work on Scarlatina, &c. page 16. " and from the examination of several bodies after death, I am warranted in affirming, that the brain, the liver, the stomach, the intestines, and the lungs, are the parts most often inflamed, and that the inflammation in these parts is generally the cause of death, together with the affection of the throat."

Treatment.—In scarlatina, as in other diseases, differences in pathological opinions have of course given rise to dissimilar methods of treatment. Some, considering it a disease of debility, recommended bark, and wine, or brandy, with nourishment, and condemn antiphlogistic means as highly dangerous; in this class of symptomatical writers stand Underwood and Dr James Hamilton Jun. It will not surprise my readers, that the first named individual, who did not live long enough to profit by modern pathology, should have taught the doctrines that prevailed in his own time; but considering the account which every author gives of the symptoms and course of this disease, and the appearances on dissection, it is lamentable to reflect that there is one author of the present day, who speaks doubtfully even of local bleeding in scarlatina, and who recommends cordials and nourishment, and even wine itself, in large quantity. But all this does Dr James Hamilton Jun.*; he goes even the length of quoting a great medical authority, *the head master of a boys' school in Yorkshire*, in whose prac-

* Vide his work on the Diseases of Children, p. 380.

tice, among the said boys, "*it was found that children under fifteen years of age, affected with this disease, required within the twenty-four hours, sometimes not only a bottle of port wine, and another of raisin, but also a proportion of brandy.*"*— Poor boys!

Underwood, in describing the treatment necessary in this disease, makes the following extraordinary statement: "*Should the affection of the throat, therefore, be evidently inflammatory, or should a case occur where the fever may seem to be of that kind, (which may be better ascertained by the hardness of the pulse than any other symptom,) it will very rarely bear bleeding, even in the beginning of the disease; as symptoms of debility generally attend in some period of the scarlet fever, and will allow only of that middle course of treatment hinted at above. In a general way a cordial plan is required throughout the disease.*" † And yet, on turning the next page, it will be found he recommends bleeding in the secondary fever; and he also tells us, that a critical bleeding from the nose has saved life, when the patient's state "has appeared very hazardous, and the prostration of strength been considerable."

In the slighter forms of scarlatina, very little treatment is necessary, further than confinement, attention to the bowels to keep them free, and the antiphlogistic regimen. In such cases, however, the medical attendant should be careful to watch diseased action, at the period when the eruption naturally declines, for reasons already mentioned. Formerly I saw many fatal cases of scarlatina, when I practised according to the opinion of the schools, carefully abstaining from bloodletting, and using all the means recommended to support the strength; but I occasionally observed patients snatched from the grave by considerable bleedings from the nose, and at times when it was thought the loss of an ounce of blood would prove destructive. These circumstances, together with the appearances found on dissection, led me to bleed in many subsequent cases, and I have never had occasion to regret it. Blood has been drawn at all periods of the disease, in cases

* Management of Children, p. 381. Ed. 1824.

† A Treatise on the Diseases of Children, p. 289.

where the state of the lungs and brain required it; and should the operation be performed during the period of the eruption, it will disappear, if a sufficient quantity of blood be taken. When the inflammation of the throat runs very high, I know no remedy productive of such certain and immediate good effects as general bleeding, but should the patient's strength be already reduced, leeches are to be preferred.

Dr T. P. Lucas of the Royal Artillery, and Dr Wilson, cannot have forgotten the case of Ann M'Farlane, aged 18, which they treated, when they were my pupils in the year 1824; from whom they took above ʒ xx of blood, with instant good effect, on the fourth day of the disease, when she had a large sloughing ulcer occupying the whole of the right tonsil. She afterwards required no other remedies but laxatives, and in a fortnight returned to her usual occupation.

A great many other gentlemen, who have been pupils at my dispensary, can be appealed to, and I may refer in an especial manner to the testimony of my talented colleague Dr Robertson, who was opposed to the practice of general bleeding in scarlatina, till he saw the success of it. When general bleeding is either inadmissible, or not thought necessary, or when the child is under two or three years of age, local bleeding by leeches will be found highly serviceable. When the throat is extensively inflamed, although the accompanying symptoms may be mild, I always think it right to reduce the inflammation by the application of leeches, followed or not by a blister, according to circumstances. Laxative medicines, frequently repeated, are very necessary. Spunging the body either with tepid or cold water, produces good effects, by allaying restlessness. Cold affusion may do no harm in the slighter forms of scarlet fever, but in the severe cases which invariably display marks of internal disease, and in which congestion has taken place, its use cannot be defended.

The tartrate of antimony has been long employed in this country in the treatment of fevers and inflammations, and it has been found very serviceable in this disease, by controlling the action of the heart, and relieving uneasiness. It may be used in the diseases of children, by dissolving one or two grains in two ounces of water, a tea spoonful for a dose as often as may be thought necessary.

Gargles may certainly be employed, and those of a stimulating nature are much lauded; but it appears to me that the best gargle is a little warm water; and I particularly caution young practitioners against attempting to syringe the throat of a young child. Inhalation of the vapour of warm water will be found to ease the throat more than any gargle. Opiates are often serviceable in the last stage, and during convalescence, to allay irritability, and procure sleep.

Since the alteration which I have adopted in practice, I rarely see secondary fever or dropsy; but too great care cannot be taken during recovery, and the patient should be cautioned against the risk that he will run from exposure, errors of diet, and neglecting the state of the bowels. Should dropsy take place, it will in general be found to be of the acute kind, with coagulable urine, with a specific gravity of about 1010°, and will sometimes require the lancet, although brisk purgatives, with diuretics, will in general suffice.

Dr Lewins was called to see a little patient of mine, who, after scarlatina, had dropsy with coagulable urine. Convulsions suddenly appeared when he was much debilitated; Dr Lewins opened a vein, and allowed the blood to flow till the boy (whose age was ten years) was relieved; the blood weighed two pounds. No debility followed, and the boy from that time made a rapid recovery, and has ever since been healthy.

In conclusion, it may be mentioned, that various affections occasionally follow scarlatina, as inflammation, and swelling of the glands, and perhaps more particularly of the parotid, which must be treated upon ordinary principles. Inflammation often attacks the internal ear, leaving a fetid discharge, followed on some occasions by incurable deafness, which must also be treated by appropriate means. These and other appearances following scarlatina, are commonly known by the term "dregs" of the disease.

MEASLES.

Measles may also be defined to be a disease attended by fever and an eruption, which appears at various periods, but

generally at the termination of the fourth, or beginning of the fifth day, and continues for three, four, or five days; after which, some discoloration is left on the surface of the body, and occasionally the cuticle separates, but not so invariably as in scarlatina.

Measles has been divided into four varieties:

1*st*, Rubeola vulgaris.
2*d*, ——— sine catarrho.
3*d*, ——— nigra.
4*th*, ——— putrida.

Pursuing the same pathological plan which has been adopted when treating of scarlatina, I shall also mention two great varieties of measles, the congestive and the inflammatory.

In the first species, which has been so well illustrated by Dr Armstrong, re-action does not take place; or if it do, it is slight, the eruption is trivial; the pulse is feeble and oppressed, perhaps quick; and the surface is free from that redness and heat which gives such a striking external character to the pure inflammatory disease. This is, no doubt, one form of the complaint called "*putrid*," and which has been described by Morton, Huxham, and Watson. The same pathology that was maintained in scarlatina, and also in the general statement concerning eruptive fevers, equally applies to this case, and renders it unnecessary to repeat the observations.

Capuron, in his treatise on the diseases of children, at page 293, makes the following statement:—"One of the most dreadful complications of measles, is that with an ataxic or malignant fever. Individuals naturally lively and delicate, as those in infancy, are more subject to it. It is one of those unlooked-for anomalies in the vital properties. The functions of the brain are disturbed; respiration is deranged, and becomes extremely constrained; in a word, the patient is *quickly* reduced to the last extremity, if something be not done for his relief. The most active treatment is here indispensably necessary to sustain life, which is shaken to its very foundation." Subsequently he states, that "infants naturally weak, or who live under the influence of debilitating causes, are exposed to an adynamic or putrid fever during the course of the measles. One detects this dangerous complication by the change in the

form and colour of the spots;—from being at first prominent, and of a lively red, they become more depressed, pale, and livid; in which case, we must prevent the prostration of strength in good time, *and direct the eruption back again towards the surface of the body* by the use of tonics, such as wine, bark, and camphor; the greatest advantage may be also obtained by epispastics, and above all by blisters." At page 294, he again observes, "there are infants in whom the progress of the eruption is arrested, the spots disappear, and pains in the chest, more or less severe, manifest themselves; respiration is oppressed; peripneumony declares itself; suffocation is threatened."

Mr Burns of Glasgow, in detailing the symptoms of measles, states, that "sometimes the eruption suddenly and prematurely recedes, or never comes fully out. Both of these cases are unfavourable, the fever is high, and the oppression great." It will be seen, by consulting the report of diseases treated at the New Town Dispensary of Edinburgh, during the last six months of the year 1816, published in the 13th vol. of the Edinburgh Medical and Surgical Journal, that this form of the disease was very prevalent, and that few children recovered; most of those attacked were of feeble habit, or weakened by previous illness, "but others appeared to have been quite healthy when exposed to the contagion." Those affected in this way were chiefly infants, but a few were children from four to seven years of age. They were ill longer than usual, generally five or six days, before any eruption appeared, having the usual catarrhal symptoms, with much debility and drowsiness; frequent vomiting; generally frequent, and sometimes bloody stools; quick pulse, and white tongue, *without much heat of skin.* When the rash appeared, it was at first less distinctly circumscribed, and afterwards less elevated than usual, of a darker colour, and attended with less heat of skin. After its recession, the patients were more or less distressed with cough and dyspnœa, generally with diarrhœa, and almost always with a frequent ineffectual attempt to vomit. The pulse and breathing became very quick; the tongue, after losing the white crust which had covered it at the beginning of the disease, became dry and hard; the posture indicated

much debility; the countenance had the languid, vacant expression of typhus; and a dark-coloured fur usually gathered on the lips and teeth. In all these cases, there was a degree of drowsiness approaching to coma; and in a few, this state appeared to be blended with delirium.

In two or three instances, infants exposed to the contagion of measles, became affected with catarrhal symptoms, fever, drowsiness, quick and oppressed breathing, and died, without any eruption being observed.

In the cases of speedy recession of the rash, if the cough and dyspnœa were urgent after its disappearance, *death almost universally ensued*, from the first to the fourteenth day after that change. But those in whom the pectoral symptoms were less distressing, recovered from the state above described, under the use of wine and cordials, which, as far as we could judge, were as decidedly beneficial in these as in any other cases in which we have seen them used. It should be mentioned, however, that one or two, who could not be prevailed on to take either food or medicines, gradually mended without any crisis being observed.

On opening the bodies of those who had died of this form of measles, a considerable accumulation of mucus in the bronchia was always found. In two infants, under a twelvemonth, there were marks of inflammation of the lungs, (which in one of these had proceeded to ulceration,) and a good deal of water was found in the pericardium. In one child, four years of age, there was such a congestion of blood in the lungs, that a large portion of them sunk in water.

In several cases, in which the eruption had almost or entirely disappeared on the second day, it re-appeared that night, after the use of the warm bath, and an opiate, and continued nearly the usual time.

An aphthous state of the mouth and tongue occurred pretty frequently, but was not confined to the unfavourable cases.

The circumstances of the livid colour, and rapid recession of the eruption, of the succeeding typhoid state, and the irritability of stomach attending that state, seem to point out a resemblance between the cases of measles now described, and the worst cases of scarlatina.

I scarcely think that such symptoms and morbid appearances support the wine and cordial treatment, which, we are told, was had recourse to in these cases. It has fallen to my lot to treat a considerable number of cases of this kind ; and the plan which experience has led me to adopt, is, first to try the warm bath with stimulating frictions ; but if the symptoms be very threatening, such as coma, convulsions, or asphyxia, or an approach to these states, the best practice, if the patient be an adult, or even a child, if a vein can be found, is to bleed at once. Many interesting cases might be detailed, shewing the advantage of this plan. The following is a short sketch of one. A few years ago, I was called suddenly to see a child in measles on the first day of the eruption; every appearance had been so favourable up to the moment of the sudden recession of the rash, that the family had not applied for medical advice. On my arrival, the eruption, which had been extensive, and of the usual colour, was not to be seen, although it still was to be felt. The child was under three years of age, and of good constitution; it had had three or four strong convulsions in the course of rather less than an hour, and was now comatose; one pupil dilated, while the other was of the natural size ; the hands were clenched. A good sized vein being found in the arm, was instantly opened, and from eight to ten ounces of blood abstracted, when the breathing, and every other appearance, became more favourable ; the pulse, which was under sixty, rose gradually as the bleeding went on, and the child soon became quite sensible. So far from debility following, it was necessary, from the appearance of cerebral irritation, to apply leeches next day to the head ; the child made a rapid recovery, and was running about in the course of a week.

In every respect, the treatment must be conducted in the manner detailed in congestive fever, as well as in the congestive form of scarlatina.

The inflammatory disease is the form most generally met with ; we have the usual eruptive fever, preceded by rigors, depression, and debility ; along with the fever, the patient has a dry cough, with hoarseness; frequent fits of sneezing and coryza. He also complains of giddiness and pain in his forehead, as well as in the back; his pulse is various, some-

times frequent and small, or frequent and strong; often it is irregular and oppressed; the bowels are generally confined, and the evacuations fetid. In the course of the second, third, or fourth day of the fever, the symptoms run higher; the eyes are tender, red, watery, and inflamed; the dyspnœa, which was slight at first, is now more severe; the patient complains of tightness of the chest, pain, and oppression at the præcordia. The eruption appears first on the face and neck, in twenty-four hours it is found on the breast, and afterwards gradually spreads over the rest of the body; it consists of small red papulæ, slightly elevated, resembling recent flea-bites; these soon form themselves into extensive patches, irregular in shape, their margins having somewhat of a crescentic appearance. The eruption is sometimes very extensive, at others slight. The throat, when examined, will be observed to be covered with small red patches, occasioning difficult deglutition.

Sometimes immediately before the eruption comes out, the patient is seized with violent sickness and vomiting; sometimes with convulsions; but if the eruption subsequently comes out freely, these symptoms abate.

In a great majority of cases, the disease is rather slight, and the internal disturbance, which is discovered by the symptoms already described, is generally very much appeased soon after the appearance of the eruption, particularly if it come out freely and plentifully. Occasionally, however, the symptoms are very severe from the beginning; the cough is frequent and harsh; there is considerable dyspnœa, with hot skin, thirst, and a quick pulse; and the child is occasionally so lethargic, that this symptom early attracts our attention.

As the embarrassment of the lungs increases, which may happen in any stage, the face becomes discoloured, and sometimes presents a purple appearance, and occasionally the eruption over the whole body assumes a dark colour; this is the state which is called *rubeola nigra*, and is probably that form of the complaint described by Dr Watson and others, under the term Putrid Measles.

After the natural disappearance of the eruption, the fever, dyspnœa, and cough, in some cases increase, attended or not with considerable gastro-intestinal irritation and diarrhœa:

occasionally inflammation of the eyes, and enlargement of the glands of the neck, succeed. Blistered surfaces frequently slough; and it has been remarked by Dr Watson, Dr Ferriar of Manchester, and others, that an ulceration of a particular character attacks the pudendum of girls, from which few recover; four cases have fallen within my observation, three of which proved fatal; and it is my opinion that death is not owing to this ulceration, but to internal disease. Dissection, in two of these cases, displayed extensive disease of the lungs, but more particularly ulceration of the mucous membrane of the intestines, of which the preparations and drawings are in my museum.*

Appearances on Dissection.—Morgagni notices the following case, which he says has been transferred from Ballonius into the Sepulchretum: "On examining the body of a person to whom it was suspected that poison had been given, the stomach was found beset with exanthemata, and the physicians were upon the point of asserting that the appearance was owing to poison, when they were informed that the person died of measles, which began to appear on the skin, and suddenly vanished."

In the examinations at which I have been present, effusions and other marks of inflammatory action have been found in the brain, and sometimes ulceration in the mucous membrane of the bowels; but I have seen no dissection in which the pulmonary system escaped. The lining membrane of the bronchia, trachea, and larynx, has not only been found in a highly vascular state, but it has been thickened, softened, and occasionally ulcerated; the ulcers are small, and generally situated near the bifurcation; the bronchial tubes are more or less filled with a matter like pus or thick mucus, as in bronchitis; the colour of this secretion varies; and it is sometimes tenacious. This condition of the air passages has always

* This is the disease which has been described in the 7th vol. of the Med. Chir. Trans. of London, by Dr Kinder Wood, who saw twelve cases, of which only two recovered. The case of recovery which I have noticed, was under the care of Dr Moffit of the 7th Hussars; the patient was a soldier's child. The disease followed a very slight attack of measles.

existed on both sides of the chest. In many cases, the lungs are found emphysematous, in others inflamed in different degrees; the inflammation rarely affecting both lungs, and it is frequently confined to one lobe. Occasionally there are extensive inflammations of the pleura, indicated by effusion of serum and exudation of coagulating lymph, besides thickening of the pleura and recent adhesions. In cases of longer standing, tubercular formations are observed in different degrees of advancement; sometimes even excavations of the lungs are seen.

It ought to be noticed, that the inflammatory appearances in the brain and bowels, together with the disease of the substance of the lungs, and the pleuritic effusions, are to be regarded as accidental circumstances; whereas the inflammation of the bronchial membrane is an essential part of the disease, and may be traced from the beginning of the complaint.

Treatment.—In the slighter forms of this disease, as in Scarlatina, very little treatment is necessary, further than confinement to one room, the exhibition of gentle laxatives, and low diet. The medical attendant should be still more watchful in this disease than in Scarlet Fever, at the period when the eruption naturally recedes, for reasons already mentioned. In the severer forms of Measles, bleeding is often necessary during the eruptive fever, when the pectoral symptoms run high, and appear threatening; and also when coma and convulsions take place, both of which are more likely to happen, but particularly the latter, if the child be suffering from difficult dentition. I was called to see a fine boy of two years of age, who, during the eruptive fever, was seized with convulsions in the night, at the period when the eruption ought to have made its appearance, and from whom nine ounces of blood were taken. Next day he had nine or ten leeches applied to his head: the symptoms were afterwards exceedingly slight, and he made a rapid recovery. He bore the bleeding without any tendency to syncope, while his brother, a boy of twelve years old, labouring also under the same disease, and who required blood-letting for pectoral symptoms, fainted upon the loss of two ounces.

When bleeding is necessary, it ought to be performed in

the manner already described when treating of inflammatory fever; a sufficient quantity should be taken as early as possible in the disease, and the operation ought to be repeated at short intervals; but when the bronchitic symptoms have been allowed to go on neglected till the air passages are gorged with mucus, bleeding is a very questionable remedy, and no doubt often does irreparable mischief, for reasons which will be fully noticed when treating of bronchitis. Leeches are to be employed as directed in Scarlatina, and also blisters.* Antimony is also highly serviceable; and opiates in the last stage, when there is restlessness and irritability, if the air passages are not filled with mucus. The warm bath affords much comfort to the patient in all the exanthemata, every night, or every other night, after the eruption has declined, and when the cuticle is exfoliating. During recovery, great attention should be paid to the diet, clothing, and state of the bowels, so as to avoid the disagreeable circumstances which so often follow the exanthemata, viz. the formation of tubercles in the lungs; inflammation and ulceration of the mucous membrane of the bowels, producing the disease which is called Tabes Mesenterica; and also glandular affections of the neck, inflammation of the eyes, and chronic eruptions of the skin.

This is a very different line of treatment from that which is still recommended by Dr James Hamilton jun. and which is founded upon the most curious notion that can well be conceived, viz. that the bad symptoms in Measles are not occasioned by inflammation, but by "*torpor of the lymphatics.*" But as this statement may not be credited, Dr James Hamilton jun. shall be allowed to speak for himself. At page 377. of the work already quoted, last edition, the following passage will be found: "As the debility which always attends and follows Measles is the most prominent feature in the progress of the disease, it is not easy to understand the reasons why practitioners have been led to overlook so obvious a circumstance. The objections to wine and nourishing diet, which it is so often

* When a blister is applied to a child, under any circumstances, the part should be carefully examined daily by the medical attendant, but more particularly in the eruptive fevers.

necessary to combat, probably arise from the supposition, that the frequency of the pulse and the cough are the effects of inflammation, when in fact they are occasioned by "*the torpor of the lymphatics*"!!!

SMALL-POX.

Small-pox is generally divided into three varieties, viz. 1. Distinct; 2. Confluent; 3. Modified. The first obtains that name when the pustules are distinct, and do not run into each other; the second is denominated Confluent when the pustules are very numerous, and coalesce; the third variety is so named from the influence of certain well-known causes that modify the disease, and render the symptoms less severe, and the cases less dangerous.

This disease commences with rigors, followed by febrile symptoms, which continue from forty-eight to sixty hours, and even longer, before the eruption appears; and it is no uncommon thing for children to be seized with convulsions during this period. The attack is frequently very sudden; vomiting generally occurs; there is pain in the head and back; and the patient complains very much of oppression at the præcordia, and pungent pain in the pit of the stomach, much increased on pressure; there are also decided marks of general disease of the mucous membranes, and more particularly that of the bronchi, announced by dyspnœa, cough, and wheezing.

The eruption first appears on the face, in the form of small red papulæ, and afterwards extends over the rest of the body. About the third day, a vesicular appearance is observed on the top of each spot, which is soon depressed in the centre, and is found to contain a transparent fluid, with an inflamed circular margin. About the sixth day the eruption loses the depression in the centre, and instead of serum, will now be found filled with a puriform matter. When the pustules are numerous, the parts swell much, and the neighbouring skin is of a red colour, from the extension of the inflammation. About the seventh day, some of the pustules on the face burst, and upon the eighth or ninth they begin to dry and scab over the rest of the body. The swelling, which affects

the face, hands, and feet, more severely than other parts of the body, gradually declines; the skin remains of a dark-brown colour after the scabs fall off, and it is many weeks before the surface recovers its natural appearance.

This is the course which the Distinct Small-pox generally runs, and when treated properly it is rarely fatal, every thing depending upon the state of the lungs and brain.

In the Confluent Small-pox, all the precursory symptoms are more severe; the eruptive fever runs higher; pain in the epigastrium and dyspnœa are more complained of; convulsions and delirium also more frequently take place; and the patient runs more risk of secondary fever, and danger from extensive inflammation, ulceration, and sloughing of the skin.

In both varieties, but particularly in the Confluent, copious salivation sometimes takes place, and soreness of the throat is a marked symptom; upon examining the mouth and fauces, vesicles or pustules may be observed on the tongue, and as far down the pharynx as the eye can reach. I have seen the same appearance on the mucous membrane of the rectum, in a case of Small-pox in which there was prolapsus ani; and in the year 1823, a great number of my pupils had an opportunity of seeing a similar case. I am not aware whether this appearance in the fauces and rectum follow an increase and decline simultaneously with the eruption on the skin. In some severe cases, petechiæ are seen, when the eruption has begun to decline; bloody vomiting and diarrhœa, with tenesmus, take place; and the dyspnœa frequently increases as the disease advances.

The inflammation in the skin is frequently so deep and severe, that the death of a portion takes place, perhaps of the cellular substance, as in carbuncle, and this is one cause of what are called pock-marks.

In Small-pox, as well as in other acute diseases, there is a congestive form, in which the system is unable to raise sufficient re-action; there is consequently more oppression; the surface is pale; the eruption flat, and never matures properly; the dyspnœa is very considerable; and I verily believe this is the form which is called the most malignant.

In severe cases, death takes place before the eighth day, but,

generally speaking, the fatal event happens some time between the tenth and seventeenth days. The proportion of deaths is said by Dr George Gregory, who must be a very good authority upon this subject, to be about one in every six persons who receive the Small-pox in the natural way. But during the prevalence of an epidemic, the mortality is sometimes one half. Indeed, it appears that, during a severe epidemic at Ceylon in 1819, the number of native inhabitants taken into hospital at Kandy, amounted to 931; of these 525 died. Since the publication of the first edition of this work, I had occasion to attend 50 cases of Small-pox, all of which were distinctly traced to the imprudence of a woman who exposed her unvaccinated child to the contagion, when visiting a sick friend. Of these 50 patients, 35 had gone through the process of vaccination; 15 had never been vaccinated, (they were infants under one year of age.) All the protected cases recovered. Of the 15 unprotected cases, 10 died. Three only of the 15 had the disease slightly. Of the 5 children who survived the attack, one did not recover perfectly, and died of chronic bronchitis some months afterwards.

Appearances on Dissection.—Head.—I have seen marks of inflammation of the membranes, evinced by a considerable arborescent vascularity on the surface of the brain, the vessels of the pia mater being greatly loaded with blood; together with effusion under the arachnoid, and into the ventricles. But it becomes me to speak with diffidence with respect to this part of the subject. Dr George Gregory says, at page 105, that he has "never been able to trace any morbid appearance in the head," which is rather at variance with the results of my limited experience, and with a statement which he subsequently makes at page 108. In directing the mode of treatment, he says, "It is to be remembered also, that in Small-pox, fully as much as in any other form of fever, there is a tendency to congestions and inflammations in the head and thorax." "A patient," (says Batting, p. 76,) "during the cure of a very extensive fracture of the skull, was seized with Small-pox, &c. It was curious to observe in this patient the appearance of variolous pustules upon the granulations of the dura mater."

Although I have been prevented, by the impatience of surviving friends, from opening the head as often as I could have wished, yet many opportunities have been afforded me of examining the contents of the thorax and abdomen. I have seen pustules in the pharynx, larynx, trachea, and œsophagus, in those who died on or before the twelfth or thirteenth day, on some occasions closing up the larynx. The mucous membrane of the bronchi very vascular, and the air tubes completely gorged with matter, most frequently of a reddish colour; but in no instance have I been able to discover a pustular appearance below the bifurcation. The substance of the lungs gorged with blood, and in the first and second stages of inflammation; and in one instance there was pleuritic effusion. On examining the body of a deformed girl, who died under an attack of Confluent Small-pox, the peritoneum and pleura were studded with small circular spots, which looked like a faded eruption, but perhaps they might have been produced in the manner which we sometimes see in cases of purpura. I have observed nothing in the stomach to account for the severe burning pain complained of in the epigastric region; the mucous membrane has certainly shewn vascularity, and has been covered with a viscid exudation, the follicles being much increased in size, which appearance often extends throughout the whole intestinal tube. In three or four instances, I have seen ulcers having a pustular appearance, with a depression in the centre, in the jejunum, ileum, and also in the large intestines, of which the preparations and drawings are in my museum; and some of them were surrounded by an inflammatory areola.

Treatment.—Small-pox under every form is a serious disease, for however mild it may appear in its attack, its consequences are always to be dreaded. The confluent, however, is a very dangerous disease; and we are to be guided in the treatment by observing the state of the brain, and the organs contained within the thorax, as well as the condition of the surface of the body.

It was formerly the custom to keep patients very hot, and to employ stimulants; and the consequence was, that the mortality was immense; but for many years past, patients have

been kept cool, and the antiphlogistic regimen recommended, but, I fear, too little practised, from the dread of putridity. Bleeding has been often employed, and strongly recommended, in this disease, particularly during the eruptive fever; but it has as often been condemned, because it destroyed that strength, which, it is alleged, is so much required in the latter stages of the disease. But the same language is used in the purest inflammatory fevers. In all the successful cases of confluent small-pox occurring in adults, which I have treated, except one, amounting in all to about eighteen, bleeding was employed, and largely employed, in the eruptive fever, to moderate what was thought to be local inflammation, without suspecting that they were cases of small-pox; several of the sufferers were my pupils, who had had themselves bled before they sent for me. In a number of instances, blood has been drawn even after the appearance of the eruption, and with decided benefit; but upon the whole, it is perhaps best at that period to trust to leeches for relieving local inflammations. The state of the throat and air passages requires daily and minute examination, and after the eruption comes out, the application of leeches is often necessary to the neck, and also to the chest, to reduce inflammation. Bleeding before the appearance of the eruption may be expected to moderate that symptom, which is of the greatest consequence, as many die from the severity and extent of the external inflammation. The appearance of petechiæ does not prevent me from ordering the application of leeches, in cases which require this practice. With respect to other points of treatment, they are similar to those which have been recommended in scarlatina, measles, and other febrile diseases. I may be allowed, however, on this occasion, to insist on the propriety of trusting to nature a little more than is generally done, when the patient begins to convalesce, avoiding attempts to hurry it on, and restore the strength, which, in a great proportion of cases, is the cause of secondary fever. A number of disagreeable circumstances often take place as sequels of small-pox, and the most painful one is the formation of boils on various parts of the body, and sometimes even carbuncles, of which there are successive crops tormenting the patient for weeks. Glandular

affections also frequently follow, as well as *ophthalmia tarsi*, and *ophthalmia purulenta*. I can state from experience, that it is a good plan to open the pustules on the face early, in order to prevent marks.

Modified Small-Pox.—There are several circumstances which are said, in medical language, to modify this horrible disease. The mysterious power of vaccination in preventing small-pox is now admitted; experience, however, has taught us, that this antidote does not always succeed; but the generality of cases of small-pox which follow vaccination are very mild. Individuals are sometimes attacked also a second time with small-pox, and in my comparatively limited experience, I have known upwards of twelve well-authenticated instances. The first attack is generally supposed to modify the second, and to render it milder; but it is curious, that all my cases of secondary small-pox, with the exception of two, were remarkably severe; whereas I have rarely seen a severe case of small-pox after vaccination.

Previously to the great discovery of Dr Jenner, respecting the power of vaccination in preventing small-pox, the disease was modified, and rendered less severe and fatal, by inoculation. This practice had been long followed in the East, and was introduced into this country from Turkey, by Lady Mary Montague.

An interesting question arises, to determine why the inoculated small-pox should be so much milder than the natural?

This is, perhaps, easily answered. A proper season of the year is chosen for the operation; the patient undergoes a certain preparation, and his bowels are particularly attended to.

In the modified disease, the stages are all shorter, and the eruptive fever is slighter; the convalescence is less tedious, and the sequelæ are not so troublesome.

This disease must be treated according to the general principles already laid down.

CHICKEN POX.

This disease, known also by the name of Varicella, has been often confounded with small-pox. Those who maintain

the identity of the two diseases, and who have figured in the controversy that has been so long carried on, have nevertheless completely failed in proving their position with respect to one point, while they have succeeded in another, apparently without being aware of it. Looking at the diseases symptomatically, there is no doubt a striking difference. The symptoms are all much slighter in chicken pox; the eruption is vesicular, and there are repeated crops; and further, this disease is rarely attended with danger; but a pathological eye cannot fail to discover a marked resemblance. The only questions to be determined are the following: Does an attack of the one disease prevent the other? Will matter taken from small-pox produce varicella, or from varicella small-pox? Extensive experience enables us to answer both in the negative, and therefore they cannot be identified any more than measles or small-pox.*

With respect to the treatment of varicella, it is only necessary to mention, that it must be conducted in the same manner with other slight eruptive fevers; and it should be remembered, that some local inflammation may arise even in the very slightest of them. I have known two fatal cases of varicella, one from inflammation of the substance of the lungs in an adult, the other from inflammation of the membranes of the brain in a child eighteen months old.† Since the publication of the first edition, I have been reminded of a third fatal case which occurred in 1825, in a child five months old. Traces of inflammation were found in the chest and abdomen. The head was not examined.

MILIARY FEVER.

This disease is characterized by an irregular eruption, of exceedingly small round vesicles of the size of millet seeds,

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* Vide Dr Hennen's papers and experiments, in Ed. M. and S. Journal, Vol. xiv. p. 409.

† It has been thought proper to pass over vaccination, as it forms a part of surgery, rather than of physic; and it has been determined not to dwell upon surgical subjects in this work.

and which feels, when the hand is passed over it, as if there were small grains of sand beneath the cuticle. Each vesicle is surrounded by a slight inflammatory blush.

This disease is said to be idiopathic, as well as symptomatic. There can be no doubt whatever, that an eruption of this character occasionally appears in the course of all fevers and inflammations; and in such cases, attention ought to be directed to the original disease. It is also considered one of the diseases of child-bed. Since women in that state have been treated in a proper manner, by avoiding hot stimulating drinks, and by admitting cool air, it is not very frequently met with. It is described by authors to commence with rigors, sickness, and languor, approaching to syncope, quick pulse, heat of skin, and thirst. The eruption does not usually appear till four, five, or six days after the commencement of the febrile attack. Previously to its appearance, there is a sense of pricking, tingling or itching of the skin, sometimes attended with a benumbed state of the extremities. The patient is greatly oppressed, and complains of a sense of weight about the chest; the spirits are low, and a profuse perspiration takes place, which is frequently remarked to have a sour smell. At length the vesicles form into small scales, and fall off in a few days.

The eruption is generally distinct, but sometimes confluent; it is said rarely to affect the face, and different crops may appear in the same fever; it attacks those most frequently, who have been previously weakened by disease, fatigue, or long continued sweating, or who have had a hot regimen. The miliary vesicles often occur during the course of many of the puerperal diseases, such as milk fever, inflammation of the brain and peritoneum.

Mr Burns, in his Principles of Midwifery, p. 420, says, "Whether the miliary fever be idiopathic or symptomatic, the treatment is the same." If he mean to state, that slight miliary eruption is to be treated in the same manner as miliary eruption "depending (to use his own expressions,) on fevers connected with a morbid state of the peritoneum or brain, which generally prove fatal," I cannot concur with him, as the eruption is to be regarded only as an accidental symptom of another disease.

Treatment.—If this disease occur in the course of inflammation of the peritoneum, brain, &c. the particular disease ought to be treated in the proper manner, without reference to the eruption. If not, the bowels are to be regularly attended to, sweating is to be avoided, as well as every thing which heats the patient; and indigestible food must be prohibited. Whenever the patient is found perspiring, the linen should be changed in a careful manner, and the body properly dried and rubbed with a soft towel; in this case sulphuric acid will be found very useful, and there can be no objection to the moderate use of wine and bitters.

ROSEOLA.

Roseola is a fever attended by a rose-coloured efflorescence, without wheals or papulæ, and apparently not contagious. It has often been confounded with measles and scarlet fever, and I have seen the wisest heads baffled in determining the point; in one case in which such a division of opinion took place between two physicians, a third declared that the patient laboured under small-pox, and the result of the case proved that his opinion was correct.

This is a disease which may very frequently be traced to indigestible matter, and particularly fruit, in the stomach and bowels; therefore the treatment is very simple, so simple, that even in the higher ranks, medical men are seldom consulted; and they would probably be still less frequently called, only that parents are afraid that it is scarlet fever. Confinement, attention to the bowels, and avoiding solid animal food for a few days, are the best means which can be adopted.

Willan and Bateman have given an account of *seven varieties* of this disease, but no practical benefit can be derived from such minute hair-breadth distinctions as these and other skin nosologists have drawn.*

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* It affords me great pleasure to refer to Mr Plumbe's Practical Treatise on Diseases of the Skin. That gentleman has taken up correct views of the subject, and treats of all the affections pathologically, therefore he has few sub-divisions. It is the best work we possess on the subject.

URTICARIA.

This disease is known to the vulgar by the name of nettle rash, and is distinguished from other febrile eruptions, by circular elevations of the cuticle, of a red colour, with a white spot in the centre, and is usually termed a wheal; and here again Willan and Bateman have unnecessarily described six varieties.

The eruption is generally preceded by marks, the most distinct, of gastro-intestinal irritation and fever; and the patient is affected with restlessness, oppression, languor, and want of appetite; his tongue, however foul, will in general be found red at the tip, and round the edges. If the eruption be very general, the patient suffers much distress from the heat and itching of the parts, but the internal disorder will be found to be relieved. Sometimes the rash appears only when the individual is heated by exercise, or by wine, or when he is undressing himself; and it is also frequently excited in a fresh part, by friction or scratching. This is an affection which is often produced by eating particular articles of food.

It appears to me, that individuals who are frequently subject to this affection, and others of a similar nature, during youth, are those who in after-life are liable to be affected with gout.

It is sometimes difficult to distinguish urticaria from another very painful and troublesome affection, which is known by the name of *erythema fugax;* but this is a matter of no practical importance, as both eruptions are produced by the same causes, and cured by similar remedies.

Urticaria may continue for an indefinite period, and may be reproduced in particular constitutions every time the stomach is disordered.

Treatment.—Nothing is more simple than the management of a case of urticaria; but much more depends upon the patient himself, than upon the remedies which a physician may prescribe. The patient must find out, by experience, the articles of food which disagree with him, and he must have sufficient resolution to avoid them for a time. It should be impressed upon young practitioners, that danger sometimes proceeds from the repulsion of the eruption by cosmetics.

A very beautiful young lady was frequently troubled with febrile symptoms and this rash. She was attended by an eminent physician, who gave her a large bottle of a strong solution of sugar of lead, with directions to sponge her body with the wash when her skin was very itchy. Upon the first occasion, she stripped herself, and applied it as extensively as she could, and it surprised her that the itching suddenly ceased; upon examination, the eruption, which was very vivid before, had now almost entirely disappeared. She instantly fell sick, oppressed, and fainted; and continued for such a considerable time in a state of insensibility, that her attendants were doubtful of her recovery. She survived, but has not since known what it is to enjoy a day's health.

Besides avoiding every thing that disagrees with a patient, it may be mentioned that gentle laxatives are essential remedies; and that an emetic is highly useful, if any indigestible matter be still in the stomach.

THE PLAGUE.

The disease which is now to be shortly described, appears to be an endemic fever, attended during its course by buboes, carbuncles, or some eruption on the surface of the body. It appears to be, under certain circumstances and seasons, highly contagious; and it would seem also to be occasionally epidemic.

The accounts we have of the phenomena of this disease are so contradictory, and the histories of morbid appearances are so few and meagre, that I have not sufficient data before me wherewith to form pathological descriptions.

The plague, it would appear, is sometimes very mild, at others very severe; and if it be a fever, of which I have now no doubt,* the symptoms must not only vary in intensity, but they must also have a very wide range of character. The

* I have had the pleasure of enjoying several communications with Dr M'Guffue, who resided many years in Turkey, and who has had ample opportunities of seeing the disease. It is his decided opinion, that the plague is a fever attended by buboes, &c.

disease must have varieties and shades arising out of one organ being more severely affected than another, as well as from local congestions and inflammations. It appears to be modified also by season, situation, and habits of individuals. It is not to be wondered at, therefore, that different writers should have given different histories of the symptoms and progress of this disease; but as yet we have no pathological description that can be depended on; therefore my observations must be brief.

It seems to be the opinion of some physicians, that the plague is nothing more than a malignant typhus, and the only peculiar symptom that has been described is the bubo, carbuncle, or the appearance of some eruption on the surface of the body; and all writers agree in opinion, that the safety of the patient very much depends upon the suppuration going on speedily and kindly. The plague, therefore, seems to be closely allied to the exanthemata, and more particularly to small-pox.

The disease appears to be ushered in by rigors and oppression, followed by heat of skin, great prostration of strength, giddiness, and headache; the expression of the countenance is besotted, and the eyes have a muddy, glistening appearance. It is stated, however, that in some cases there is a ferocious aspect; in others, the patient's look is subdued. The pulse varies much; it is sometimes quick and full, at others, quick and small; sometimes described as being hard, at others soft. The intellect is sometimes clouded; at others, there is insensibility and fierce delirium; occasionally stupor takes place, and in some cases the functions of the brain remain distinct and clear. The patient, in general, seems indifferent respecting his fate; the tongue is at first moist, although it may be more or less loaded; there is sometimes constipation, at others diarrhœa; the stools are always highly offensive; the stomach is in general very irritable, every thing taken being almost instantly rejected.

In a few days from the first attack, generally the third, pains, often acute, are complained of in the groins and arm-pits; and unless the swelling and suppuration of the glands go on quickly, death soon takes place. Sometimes carbuncles appear with or without the buboes; but petechiæ more frequently

than carbuncles. Discharges of blood from the stomach and intestines often take place in the last stage. Sometimes the disease is very rapid in its progress, running through its course in thirty hours. It is said, that if the patient survive the fifth day, the bubo being completely formed, he may be pronounced to be doing well, if not actually out of danger. As in the acute eruptive diseases, there are two periods fraught with greater danger than others, viz. that at which the bubo makes, or ought to make, its appearance, and that at which it ought to be matured.

The convalescence, as in all severe fevers, is very slow, which is attributed to the extremely debilitated state in which the patient is left; but there can be little doubt that a great deal is generally owing to bad nursing, and want, perhaps, of sufficient comforts.

It is a curious and interesting fact, that Sir James M'Grigor and Sir John Webb, the former the Director-General of the Medical Department of the Army, the latter Director-General of the Medical Department of the Ordnance, should have distinguished themselves in the same field of investigation, having been both employed with our Egyptian army above thirty years ago, when they displayed that talent, zeal, and humanity in the performance of their duties, which endeared them to all who were placed under their care. It was there these distinguished persons gave evidence of the great powers of mind and regular habits of business, which marked them out, as men admirably qualified for the high situations in which they have been subsequently placed, and which they have filled with so much honour to themselves, and benefit to the service. Their statements respecting the plague, will be read with much interest and advantage.*

Treatment.—Sydenham recommended free and repeated venesection in this disease, during what may be called the eruptive fever, and it has occasionally been practised since his time; but even Sydenham himself seemed latterly to prefer

* Sir James M'Grigor's Medical Sketches of the Expedition from India to Egypt.—Sir John Webb's Narrative, 6th vol. Medical Transactions.

sweating the patient, under the idea of withdrawing the pestilence in that way from the body, which weakened him less than blood-letting. Some individuals condemn bleeding entirely. The same difference exists with regard to purging. Cullen condemns both, upon theory, but recommends the violence of re-action to be moderated, as far as it can be done, "*by taking off the spasm of the extreme vessels.*" The application of oil to the surface of the body is believed to be a preservative, and it has also been employed to cure the disease; but even upon these points, such opposite statements have been promulgated, that we have no means of forming correct opinions. A great number of other remedies have been strongly recommended,—as mercury, wine and bark, opium and æther, emetics, diaphoretics, and the cold affusion; and if my notions of the disease be at all correct, there are cases and stages in which several of these remedies, if not all of them, may prove highly beneficial; but there are others in which they must have the opposite effect. For example, if there be violent inflammation and congestion of the brain, no one will say that wine, æther, bark, or camphor, are the proper remedies; but in which cold applications to the head, and the action of mercury, might be beneficial. In the last stage of the disease, the lancet would be most improper, when wine, æther, opium, and even brandy itself, may snatch the person from the grave. If the stomach be irritable, which it almost always is in this disease, no one, I hope, would think of making it more so by exhibiting emetics and large doses of bark. It is to be feared that the recommendation and condemnation of various important remedies have taken place, without reference to the stage of the disease, the particular organ or organs affected, the peculiarities of the prevailing distemper, as well as the idiosyncracy of the patient; but it becomes me to speak with diffidence upon a subject respecting which I must acknowledge myself to be profoundly ignorant.

The reader who wishes for more minute information, must peruse the various works published on this subject; or a most excellent abstract of them, in the 3d volume of Dr Mason Good's Study of Medicine. The chapter on the Plague appears to me to be the most meritorious part of his work.

PART II.

DISEASES OF THE ORGANS CONNECTED WITH THE DIGESTIVE SYSTEM.

CHAP. I.

DIFFICULT DENTITION.

Few children go through the process of Dentition without some suffering; and when teething is difficult, many complaints arise, which fall under the denomination of Infantile Diseases. These are, fever; determinations to the head, occasioning inflammation of the brain and its membranes, or convulsions; cough, and difficulty of breathing; bowel complaints; cutaneous and glandular affections; inflammation of the eyes, and sores behind the ears.

Authors have long remarked, that children who teethe at an early period, have least suffering; and the same observation has been made with respect to those who have a considerable flow of saliva. There have been instances of children born with teeth, which happened, it is said, to Richard III. and Louis XIV.; and Haller has cited a considerable number of similar cases.

Some infants cut the first pair of teeth by the end of the third month; in other instances, not until they are sixteen or eighteen months old. In general, however, they are cut between the sixth and eighth month. The two centre incisors of the lower jaw commonly appear first; in the course of a month, their opponents in the upper jaw protrude; after this, the two lateral incisors of the lower, and then those of the upper jaw, appear. Between the twelfth and sixteenth month,

the anterior grinders of the lower, and then those of the upper jaw are cut; subsequently the cuspidati or eye-teeth protrude, and after these the posterior grinders; so that children usually have the first set of teeth (twenty in number) complete, by the time they have attained the age of two years, or two and a half. There are generally intervals of several weeks between the cutting of each pair.

The formation of each tooth goes on in a membranous and vascular sac, which is firmly united to the gum; and if we attempt to tear the gum from the jaw, the sac is brought along with it. This sac, it would appear, subsequently becomes absorbed; but when it is thicker than usual, more vascular, and long of being absorbed, it is one of the alleged causes of Difficult Dentition. The irritation produced by the pressure of each tooth against the gum, in its advancement to the surface, particularly when the child teethes late, and the gums are hard and cartilaginous, also occasions the different phenomena which are ranked under the same appellation.

A child in such circumstances is observed to be restless, fretful, and feverish; to sleep little, and is often seized with sudden fits of screaming. The bowels are out of order, and the evacuations fetid. On some occasions, marks of determination of blood towards the head take place, viz. great restlessness, flushed face, sudden fits of crying, apparent suffering when brought into the erect posture, startings, slight spasmodic movements of the muscles of the face, and even general convulsions.

Many children, whenever they cut a tooth, are teazed with a cough, depending on bronchitic irritation or inflammation. This is announced by wheezing. Others suffer from constipation, while many are afflicted with troublesome diarrhœa.

Cutaneous and glandular affections are often observed during Difficult Dentition. The glands of the neck, and the submaxillary, are those generally affected, and they sometimes suppurate. Of the eruptions, the porrigo larvalis, and lichen, are those most commonly seen.

Occasionally there is inflammation of the eyes, particularly those forms which are termed ophthalmia purulenta and ophthalmia tarsi; and sores take place behind the ears, which seem

to operate beneficially. This statement will shew the propriety of examining the mouth, when we are called to a child labouring under these or any other affections during the period of Dentition; when the mouth may feel very hot, and on examining the gum over the tooth which we suspect, it will be found to be elevated, very red, sometimes white and shining: the ridge or seam, which runs along the jaw in the direction of the teeth, will in general be found to have disappeared. If such appearances present themselves, the tooth may be pronounced to be far advanced; at all events, it is well to be able to say whether it be near at hand or not, as mothers are often disappointed if the tooth over which the gum is cut, does not shew itself in a day or two; whereas, if they are previously told that it is not so near, they will in general be satisfied. The best remedy is to divide the gum, down to the very tooth, by crucial incisions. Many people entertain a dislike to this operation, from the idea that the gum is hardened by the cicatrix; but they may be safely assured that this is not the case, and that the tooth will be advanced, certainly not retarded, by the scarification. If the operation be effectually performed, it constitutes the principal part of the treatment. Should the gum even heal immediately, the bleeding will remove the local inflammation, upon which the febrile symptoms frequently subside. The bowels must be kept freely open, and the tepid bath is often of great service. If the face be flushed, with other marks of determination to the head, the application of cold may be tried; the child should at least sleep without its cap, and use a hard pillow; frequently have I seen it advantageous to change a down pillow for one filled with fine shavings. It is probable that some of the serious affections of the brain to which children are liable, may be attributed to warm caps and soft pillows. The bowels must be more freely acted upon; and if these means do not succeed, it will be well to apply leeches to the feet, which may be subsequently placed in warm water, for the purpose of encouraging the bleeding; besides which, the hœmorrhage is better under command upon the application of a bandage. Many practitioners are heard to complain of the great difficulty in stopping the bleed-

ing in young children, but I never experienced any impediment. In the *first* place, we ought always to point out the situation where the leeches ought to be placed, which I take care shall be, if possible, over a bone, against which pressure can be applied. *Secondly*, not to apply too many at a time. It is rare to find more than one orifice troublesome, from which the bleeding will be easily suppressed, by gently pinching the skin between the finger and thumb for a few minutes. I have never been obliged to use the actual cautery, or even caustic.

We are often not called, however, till convulsions have actually taken place, which are to be treated in the manner to be subsequently described in the 2d volume. I may, however, mention here, that the child should be put into a warm bath as soon as possible; the face sprinkled with cold water; and if a fit should continue long, and threaten danger, a vein should be opened on the instant. Should the external jugular be readily observed, blood may be drawn from it; but if a vein cannot be found, the hot bath and stimulating frictions must be trusted to till leeches are obtained. Great attention should be paid to keep up a brisk action in the bowels, by means of suitable doses of calomel and jalap, or calomel combined with rhubarb or scammony, together with castor or croton oil and injections; but all these means will be of no avail unless the gums be freely scarified.

Cough is occasionally a troublesome attendant on teething, and practitioners will be found, in general, to act empirically, unless they are able to ascertain whether it depend upon any diseased action in the lungs, or merely upon irritation about the epiglottis and pharynx. If the latter, a common cough mixture may do good; but it will be inefficacious, perhaps injurious, if the cough proceed from bronchitis, which may sometimes require the application of leeches or of a blister, or contra-irritation produced by a mustard plaster, or the ointment of tartar emetic. If the lungs be very much loaded with mucus, which is easily ascertained, an emetic will be very serviceable; but the treatment of bronchitis need not be dwelt upon in this place. It is only necessary to state the general principles, with reference to the affection now under consideration.

When a child, who is suffering from difficult dentition, has diarrhœa, we should not be in a hurry to check it, particularly if there be marks of determination to the head. The bowel complaints of children are of so much importance, that it is necessary to treat of them in a separate article, with a view to point out their pathology; but it must be mentioned in this place, that the best practice is to exhibit a little castor oil in the first instance; and if there be any pain in the abdomen, warm fomentations are to be used; should there still be signs of suffering, a leech or two may be applied, followed by very small doses of Dover's powder, or a drop or two of Battley's sedative solution of opium.

It is very fortunate that children, upon the occurrence of the most trifling febrile symptoms, or disorder of the bowels, are liable to eruptions on the surface, because they act beneficially by removing irritation and increased action, on many occasions inflammation itself, from internal organs. When these eruptions take place during the course of dentition, it will almost always be found best not to meddle farther with them than to enjoin cleanliness; indeed, on many occasions, do what we will, the eruption continues, the child becoming better between the periods of cutting teeth. I have frequently seen great mischief done when external applications had the effect of repelling the eruption, and on more than one occasion death itself. In "*porrigo larvalis*," when there is great heat, itching, and inflammation of the part, I have found it answer well to apply leeches to the inflamed surface, and to cover the part with oiled silk. The child's hands should be muffled, to prevent the face from being scratched and disfigured.

Glandular affections may be safely let alone, unless they become inflamed and painful, when the practitioner will do well to apply either leeches, fomentations, or a soft warm poultice. If matter form, the sooner it is let out the better, in whatever constitution it may occur, there being far more danger of leaving a disagreeable mark, by allowing the pus to discharge itself spontaneously, than by using the lancet.

We are often consulted respecting inflammation of the eyes at this period of life. Generally speaking, the disease will be found to be confined to the conjunctiva; sometimes to the

tarsi; there is rarely deep-seated inflammation of the eye itself. A leech or two applied to the temple, is always safe practice, as well as a blister behind the ear; indeed Nature points this out, by the relief which supervenes upon a natural sore appearing in that situation. Let me add, that whenever we have occasion to blister a child, we should be careful that none of the powder of cantharides is sprinkled upon the surface of the plaster, which frequently creates unnecessary irritation; and above all, the blistered surface should be carefully examined every day by the medical attendant, till it shews a healing tendency, as it is apt to slough, which the timely application of a linseed poultice will very frequently check. With respect to the natural ulcerations that take place behind the ears, it is only necessary to use frequent ablution with warm milk and water, and to take care that they are not unnecessarily irritated. Great uneasiness is often produced by carelessly removing the dressing; this might always be avoided by previously applying tepid fomentations. An occasional opiate is very beneficial; but no medicine of this kind should be left in the way of an ordinary nurse, who will often administer it to secure to herself a quiet night, to the great injury of the child; even Dalby's carminative, or syrup of poppies, should never be left in the nursery. I have known many children destroyed by their constant exhibition. The American soothing syrup is another remedy that is perhaps too frequently ordered by medical men: it is supposed to *soften* the gums, and to render the process of teething easier; which it does, not by mollifying the gums, but by virtue of a narcotic principle which it contains.

A child, when teething, carries every thing to its mouth, bites it, and thereby seems to experience relief, and nothing will be found to please it more than rubbing the gums with the finger. A gum-stick promotes the flow of saliva, and amuses the infant.

CHAP. II.

DIFFICULT DEGLUTITION FROM INFLAMMATION, ULCERATION, OR ENLARGEMENT OF THE TONGUE; CYNANCHE TONSILLARIS; CYNANCHE PHARYNGEA; INFLAMMATION OR ULCERATION OF THE ŒSOPHAGUS.

DIFFICULT deglutition may be produced by inflammation, ulceration, and enlargement of the tongue; which are often caused by the action of mercury and other metallic poisons, and still more frequently by disease of the digestive organs. If the affection be produced by mercury, leeches applied to the cheeks are said to be very useful, as also a wash composed of a solution of the chlorate of soda, or that of lime. Several serious cases of inflammation of the tongue have lately been published. Two will be found in the 92d and 93d Nos. of the Edinburgh Journal, and a fatal one in the 214th No. of the Lancet. I am inclined to believe that inflammation and enlargement of the tongue are generally owing to some temporary diseased action in the chylo-poietic viscera. The experience of any professional man may be appealed to, who is liable to derangements of the stomach and bowels, whether he has not, on such occasions, felt his tongue sometimes swollen and painful, and even slightly ulcerated in different parts of the tip and edges; and whether he has not been led to attribute such a condition to a morbid state of

his digestive organs? Whether this view be correct to the full extent or not, the stomach and bowels must be attended to in the treatment.

Children in particular are very liable to white specks, vesicles, or ulcerations on the tongue, and over the whole mucous membrane of the mouth and fauces. These specks are called aphthæ; we meet with this affection in two forms, one of which is mild, the other very severe. In the first, the treatment consists in keeping the bowels gently open, avoiding solid food, and using the warm bath. In the last, I feel persuaded, from the vomiting, griping, and purging, and the intensity of the other symptoms, that the disease affects considerable portions of the intestinal tube, and requires a different plan. Before the appearance of the ulcerations in the mouth, the constitutional symptoms occasionally run high, which are sometimes relieved upon the mouth becoming sore; so that this affection has some resemblance to the exanthemata. Mr Burns, in describing this disease, states, that "*the child is sometimes drowsy, and oppressed for some hours, or even a day or two, before the spots appear, and occasionally is affected with spasms. The fever and oppression are often mitigated on the appearance of the aphthæ.*" Children affected in this manner, suffer great pain, and are consequently exceedingly peevish. The stools are generally acrid, sour, and discoloured; there are often tenesmus, and prolapsus ani, the surface around the anus being excoriated. Successive crops of aphthæ appear, which resemble small portions of curdled milk adhering to different parts of the tongue and mouth; after a time they become yellow, and seem to slough off, but may be renewed many times. When they drop off, the parts below frequently look raw, particularly in severe cases, in which the crust sometimes becomes dry and hard; occasionally the parts look very foul, dark-coloured, and have a fetid smell. A case of an adult lately fell under my observation, in which great suffering was produced; the sloughs were most extensive, and portions even of the palate itself were thrown off.

The diseased action frequently extends into the air passages, announced by dyspnœa and cough. Children brought up by the spoon, are more liable to aphthous affections than others,

as well as those whose bowels are neglected, and are insufficiently clothed.

Treatment.—The above pathological description of the disease, leads at once to the proper mode of practice. In the two cases of inflammation of the tongue recorded in the Edinburgh Medical and Surgical Journal, V. S. and the application of leeches, produced temporary benefit only, while deep scarifications were had recourse to with permanent advantage. It is probable, however, that sufficient attention has not been always paid in similar cases to the condition of the stomach and bowels.

With respect to the severe cases of aphthous affections of the tongue and mouth, I can speak strongly of the advantages derived from the frequent application of leeches to the abdomen, if the strength be good; the warm bath, and contra-irritation on the abdomen by means of a stimulating embrocation, or the tartar-emetic ointment. The contents of the bowels should be discharged by an occasional dose of castor oil, or a few grains of rhubarb. An injection, composed of a few drops of laudanum, and a table-spoonful of starch or gruel, may be thrown into the rectum, by means of a small penis syringe; but it is difficult at all times to make a child retain it. Dover's powder, united with aromatic powder, is also a good remedy.

If a child upon the breast be affected in this manner, no other food should be allowed; if it be already weaned, ass' milk ought to be provided; but if that cannot be procured, whey mixed with a little cream, and occasionally a little thin gruel, may be substituted; beef tea, and soups of all kinds, are, according to my own experience, bad, until the disease be far upon the decline; if the child's strength be sinking, wine, properly diluted, is far less exceptionable than soups or animal jellies. A weak solution of the chlorate of soda, combined with an opiate, will be found serviceable, a tea spoonful for a dose. Considerable mischief is sometimes done, and children are very much and unnecessarily fretted, by the application of borax and sugar introduced into the mouth upon a cloth, or a finger, and rubbed so as to remove the crusts.

CYNANCHE TONSILLARIS.

THERE are two varieties of this affection, the acute and chronic. In the acute, the swallowing is difficult and painful; the voice is altered, and in very severe cases the respiration is impeded; the pain, generally speaking, is severe. On looking into the throat, the tonsils, uvula, and even part of the palate, are seen much swollen, and very vascular, and sometimes the throat is swollen externally. Loss of appetite, thirst, headache, and general fever, for the most part, accompany this disease; occasionally these symptoms run high, and there is delirium. In some cases, only one tonsil is inflamed; in others, the uvula only; sometimes white specks are seen upon the inflamed parts, surrounded by a viscid exudation, which present the appearance of ulcerations. The white specks alluded to, are sometimes produced by exudations of lymph, at others, by sebaceous matter projecting from the follicles.* This form of sore throat bears a considerable resemblance to the cutaneous affection termed Acne. Occasionally, however, actual ulcerations are observed in the throat.

Cynanche tonsillaris terminates in resolution; sometimes in suppuration, ulceration, and sloughing. When matter forms, the patient's sufferings are generally increased, the dyspnœa is considerable, and he is said in common language to have a "quinsy."

The most frequent cause of this complaint is supposed to be cold, produced by sudden vicissitudes of weather; but I imagine there is a combination of causes in the production of inflammation of the throat, and that the principal are a disordered state of the stomach and bowels, and the formation of sebaceous matter in the follicles. Many individuals are known to me, who never have a sore throat, unless the stomach and bowels have been for some time out of order; as well as others, who for a series of years have escaped an attack, by regulating themselves properly in this respect.

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* It has often been in my power to prove, that the sebaceous matter is one cause of a "bad breath."

Treatment.—This complaint is sometimes very little under the power of the usual remedies, unless it be attacked at the very beginning; and it is in such cases only, or to check the inflammation from running into extensive ulceration or sloughing, that V. S. is admissible. Leeches may be applied externally, under similar restrictions. It has been recommended, that they should be applied internally to the part immediately affected; in which last case, each leech is introduced by means of a tube, with a thread through the tail; but when it is thought necessary to draw blood from the part affected, it is much more easily and speedily done by scarifications, producing less pain to the patient. Blisters are very frequently useful. Females have a great objection both to leeches and blisters; but particularly to the former, from the marks they produce. Laxative medicines are highly necessary, and must be frequently repeated. Emetics are much extolled. The best gargle, if it be necessary to wash the throat, is a little warm water, or acidulated infusion of roses. Inhaling the vapour of hot water is productive of great benefit, whether suppuration is to take place or not. When matter forms, dyspnœa frequently becomes a marked symptom, therefore the sooner it is discharged the better for the patient; and it is by no means a painful operation, the relief being often instantaneous. Several fatal cases have come to my knowledge, in which it is strongly suspected that the immediate cause of death has been inflammation extending into the larynx and bronchial tubes.

Chronic Cynanche Tonsillaris may be either the consequence of acute inflammation terminating in the chronic state, or may take place as the effect of sub-acute inflammatory action; the uvula is found enlarged and hard, as are the tonsils. If the case be recent, stimulating applications are found useful, and a succession of blisters to the throat. If these means do not succeed, and the enlargement is permanent, particularly if the voice be affected, the patient becomes an object of surgical treatment, and the parts have been excised.

Sometimes extensive and troublesome ulcerations are produced as the effects of chronic, as well as of acute inflammation in the throat; and in treating these, it is necessary in the

first place to attend to the general health, by regulating the state of the stomach and bowels, and also the diet, which ought to consist of mild and digestible substances. Leeches and blisters are often serviceable; but the most efficacious application, is a solution of the nitrate of silver in distilled water, in the proportion of four, six, and even ten grains to the ounce. The ulcerated surface is to be carefully washed, before the solution is applied. This operation, however insignificant it may appear, must be done with proper care, as bad consequences have been known to follow. There is a preparation in my museum, in which the epiglottis is completely destroyed by common caustic, rudely used, which was the cause of death.

INFLAMMATION OF THE PHARYNX.

In this affection the tonsils and uvula are not invariably inflamed, but upon looking, the parts being exposed to a bright light, we can often see the throat and pharynx very vascular, and loaded with viscid lymph, which the patient is constantly making efforts to dislodge by hawking and spitting.

The pain on swallowing is fully greater than in the last described affection; I have seen patients suffering severely, some apparently in great danger. When it is recent and severe, the lancet must be used, followed or not by the application of leeches and blisters, according to circumstances. The inhalation of the vapour of hot water affords remarkable mitigation of the symptoms; and in slight cases, nothing further is required but to keep the bowels open, and allowing moderate nourishment.

INFLAMMATION AND ULCERATION OF THE ŒSOPHAGUS.

Of all the structures in the human body, the œsophagus is perhaps the least liable to disease. In general it is difficult to detect inflammation of the œsophagus till ulceration and constriction take place. I have seen one case only of universal inflammation of this tube not caused by poison, in which the lining membrane was in a sloughing state. There is a prepa-

ration in my museum that displays similar appearances; in this instance, however, there were no symptoms indicative of disease in the tube. In the former case which I attended, there was pain and difficulty in swallowing. Both patients were also affected with Phthisis. Inflammation may be partial, affecting only a part of the calibre of the œsophagus; and if ulceration follow, there will be no contraction, but the patient will feel slight pain and a momentary stoppage when the bolus of food arives at the spot. If the whole calibre of the œsophagus be involved in the inflammation, the pain will be more considerable, not so much from constriction as from the effort to vomit, which is produced by irritation. If it terminate in ulceration, occupying the whole tube, constriction will take place, with increased difficulty in swallowing. Patients have been known to be three and four days, and even a week, without food.

Treatment.—Attention to the bowels, topical bleeding, and extensive contra-irritation, are the best means that can be employed. Nourishing injections thrown into the rectum, are to be assiduously administered when the patient is unable to swallow a sufficient quantity of food. It is the practice in such cases, to introduce instruments to dilate the œsophagus, but I have seen it very injurious in several instances, when the operation was performed during the inflammatory stage. Affecting the system with mercury has been highly extolled, but perhaps without sufficient consideration. If the constriction be permanent, after the inflammation and irritation are subdued, a surgeon may be called to make cautious trials with a bougie; perhaps a common œsophagus tube will be found the best instrument for this purpose.

CHRONIC AFFECTIONS OF THE ŒSOPHAGUS.

Sometimes the gullet is diminished in diameter by fleshy excrescences; tumours, or occasionally scirrhous contractions are observed; and more rarely, ossification. Some individuals have survived contractions of the œsophagus for a great many years, being obliged to have food introduced into the stomach

through a tube. Chronic diseases of the œsophagus are frequently found to have made considerable progress before their existence is even suspected.

The smoke of tobacco and stramonium, the abuse of mercury, and drinking fluids either excessively hot or cold, have been assigned by writers as the general causes, but perhaps too hastily.

Of all the remedies which have been recommended to us in such cases, the bougie is undoubtedly the best; and if at any time there should be much pain, leeching, contra-irritation, and narcotics, are to be had recourse to.

Many other circumstances produce difficulty in swallowing, as for instance, want of the uvula, tumour in the pharynx, ulcerations in the larynx, or upon the epiglottis. The first two belong more to the surgical department than the medical, and therefore cannot be treated of in this work; the last two shall be noticed among the diseases of the respiratory organs.

CHAP. III.

INDIGESTION.

Under this head I shall treat of the affection which is commonly called Dyspepsia, with its usual attendants, Flatulency, Tympanitis, Pyrosis, and Heartburn; and also of the painful affection termed Gastrodynia.

Dyspepsia is a most troublesome disease to treat; and I believe the physician, to be able to do so effectually, should have suffered from it himself, as one who has had the good fortune never to feel as if he had a stomach, can scarcely believe, or almost listen to, the complaints of those who have experienced that sensation. One symptom is more prominent and urgent in one case than another; a little flatus in the stomach occasionally produces violent nervous symptoms, sometimes as if the brain were seriously affected; and the whole will vanish after one or two sour eructations. Some patients appear as if they could not survive the difficulty of breathing under which they labour; and it will be found to depend, perhaps, on flatus rising in the œsophagus, producing the affection called *globus hystericus*. Remedies have not the same effect in any two cases; all plans of treatment will most generally fail, unless the patient himself can discover what articles of food agree with him better than others, and has resolution enough to adhere to a proper regimen.

Dyspepsia may arise from various causes. Perhaps the following are the principal causes:—*First*, From simple functional derangement of the stomach, duodenum, liver, spleen, or pancreas; *second*, From indigestible and acrid substances taken into the stomach; *third*, From structural derangements

in the digestive apparatus; *fourth*, From long-continued constipation; *fifth*, From derangements in other important organs.

Dr Wilson Philip, who has written on this subject, has divided the disease into three stages. This plan would do admirably well, if dyspepsia were as regular in its march as intermittent fever; but in practice, such an arrangement will be found to be too arbitrary to be useful.

First Stage of Indigestion.—The first symptoms of indigestion are a sense of fulness and uneasiness in the region of the stomach, arising either from too great a load of food, from some indigestible article, or from flatulent distension of the stomach; frequent acid eructations, constipation, loaded tongue, and some thirst, follow. Sometimes sore throat is complained of, and a feeling in the eyes, as if sand were lodged between the eye-lids and ball; it is difficult to keep the hands and feet sufficiently warm; and occasionally there is severe headache, accompanied by nausea, or violent vomiting.

These symptoms may steal on slowly, and from being felt only occasionally, are neglected; or they may be produced suddenly, by indulgence in improper food, a copious draught of very cold water, or from anxiety, grief, fright, or other severe mental affections, or by too violent exercise after a full meal.

Physicians are rarely consulted in the first stage of the complaint; for the patient either drives on through it, or relieves himself by a day or two's abstinence, and by taking a laxative. If a person, however, take little heed of himself, he is soon heard to complain of restless nights, oppression at the præcordia, and becomes sensible of diminution of strength, and heat of skin; his appetite becomes fastidious; he is either very costive, or is affected with diarrhœa. The alvine discharge is sometimes very bilious; at others white, shewing a want of bile; it is adhesive, drops with difficulty from the body, and is very fetid. After the patient obtains passage from the bowels, he still feels much loaded, and very often considerable quantities of half-digested food will be observed in the stools.

Persons labouring under such symptoms, will very generally be heard to attribute their complaints to a "*fit of the bile;*"

and many medical men, I fear, confound stomach disorders with those of the liver, and too frequently exhibit powerful mercurial preparations, to the great injury of the patient.

Treatment of the first stage.—The cure of this form of the complaint is not difficult. The patient is to be directed to abstain from the use of soups, and whatever else distends the stomach; to eat and drink little, and to leave off while he has still an appetite; to keep his bowels open with a little rhubarb, Henry's calcined magnesia, or a compound colocynth pill; and to take regular exercise. He should, as much as possible, avoid any cause which has a tendency to produce either mental excitement or depression.

The second stage of Indigestion is marked, according to Dr Wilson Philip, by the supervention of tenderness in the epigastric region, and a hard pulse; and he very justly considers these two symptoms of much practical importance. The patient now feels very sensible to the impression of cold; he is often chilly, and afterwards complains of flushes of heat; his hands and feet have sometimes a dry, burning sensation, particularly during the first part of the night, extremely cold at other periods, painfully so when he first goes to bed; his skin becomes hot in bad cases, but towards morning a perspiration breaks out, and the patient enjoys some quiet sleep. When he awakes, although he may complain of not feeling refreshed, yet the symptoms are greatly relieved. His debility is now greater, with some emaciation; he complains of languor, and always desponds. There is considerable uneasiness and fulness in the epigastric region, and an occasional darting pain towards the spine, together with a burning sensation in the stomach. Palpitations are now, perhaps, very troublesome; they are not constant, but become worse after dinner; the least thing agitates the mind, and produces them. The patient sometimes coughs and expectorates in the morning, and supposes he is consumptive; or there are vertigo, and sometimes violent headache, with imperfect vision, as, for instance, seeing two objects instead of one, or only half an object; and it is impossible to persuade him that he is not threatened with apoplexy.

In cases of dyspepsia, some individuals, particularly those

with light hair, are very liable to inflammation of the tarsi, with purulent exudation; and sometimes little abscesses form, which are called in common language "styes." The kidneys frequently suffer, the flow of urine being either too sparing or too copious, attended with complaints which are called "gravelish." It is my belief that dyspeptics are more liable than others to inveterate skin diseases, and to stone in the bladder. It will be found also that most of the individuals who labour under hœmorrhoidal affections are dyspeptics; and it may be mentioned, that I have rarely seen a person afflicted with *fistula in ano*, excepting when it proceeded from external injury, who has not been a martyr for a long period to this class of complaints. Pure surgeons should make themselves acquainted with these facts, and a great many other points of medical pathology.

It is rare to observe all these complications, but they are occasionally met with in the same patient. I have seen many persons consider their lives as burdens to themselves, and there is often a strong tendency to commit suicide.

Should the symptoms continue severe for a considerable time, some serious organic lesion may be dreaded; but the lungs, liver, kidneys, and brain, are the organs that most frequently suffer, and form what may be termed the third stage of dyspepsia.

Treatment of the Second Stage.—Whenever the patient complains of tenderness in the epigastric region, with a hard pulse and bad nights, local bleeding by cupping or leeching frequently produces the best effects. My own plan, in severe cases, is to apply leeches, to the number of twelve or eighteen, two or three times if necessary, before contra-irritation is had recourse to; and the best method of producing irritation, is by frictions with the tartrate of antimony ointment, which must be persevered in, first on one part, then on another, so as to produce a succession of pustules. I have been led to place much dependence on this practice, by observing that dyspeptics have sometimes been relieved, at others cured, upon the appearance of a spontaneous eruption. In severe cases, the diet should consist of gruel, arrow-root, milk, calf-foot jelly, light pudding, and good bread; and these should be allowed

in limited quantity; more than a breakfast tea-cupful at a time will overload the stomach. Soups and vegetables should be avoided, at least for some time. Gentle laxatives, so as to open the bowels twice a-day, are to be used. The tepid bath will be found very useful; but perspiration must not be encouraged after coming out of the bath. The patient should be clad according to the season of the year; and it is of great consequence to keep the feet comfortably warm and dry; in order to ensure this, worsted stockings are too frequently directed to be worn, which, in many individuals, will produce the very circumstance it is wished to avoid. It was a long time before I could discover the cause of this; and I believe I may now state confidently, that worsted stockings, worn by people whose feet perspire, will tend to produce coldness of the extremities. In such circumstances, I find the object is attained, if the patient wear an under stocking either of silk or thin cotton. Exercise in the open air is highly necessary as soon as the patient's strength will permit; if he ride on horseback, the feet should be additionally protected in cold weather by cloth boots, and he should never make use of horse exercise for two or three hours after a meal. By degrees, he may be allowed a small tea-cup full of chicken or beef tea; subsequently, he may eat part of the breast of a chicken or game to dinner, till he is able to return to ordinary fare. The physician, in severe cases, ought to insist on his patient keeping notes of his diet, particularly during his recovery, which will enable him to compare his present state of health with the articles he had eaten the day before. The best diluents he can use are, an infusion of camomile flowers and lemon-peel, and wine and water in small quantity. Stimulants are to be commenced with great caution, and not until the pain in the epigastric region and heat of skin are subdued; perhaps the best stimulant is cayenne pepper with food, which affects the whole bowels as well as the stomach, and tends to obviate constipation. Ginger tea will be found serviceable, together with a glass or two of good sound wine once or twice a-day. Wine sometimes, however, produces acidity, in which case a small quantity of brandy in water is found an agreeable substitute.

Dyspepsia is one of those diseases too generally treated by the routine practitioner, from its name, without reference to the pathological condition of the body on which the numerous symptoms depend. If such a practitioner were asked, what he would prescribe for a person who had dyspepsia? he would quickly reply, "*tonics!*" I have no objection to the medicines which are usually administered under the denomination of tonics, provided they are not given for the purpose of running up a bill, or prescribed at times when something better might be done for the patient. But I have some doubts respecting the truth of the received notion of their action, I do not think it is by giving tone to the stomach. These remedies are generally bitter, and, I imagine, produce increased secretion of the fluids connected with the digestive process. On putting a little quassia or gentian into the mouth, immediately a flow of saliva takes place, which continues as long as the taste is perceptible, and even afterwards, when the person thinks of the bitter taste. May not a similar action in other organs, follow the application of the same substance?

If the liver be not doing its duty properly, calomel, hydrargyrus cum Creta, or the blue pill, may be occasionally exhibited at bed-time, followed by a very small dose of salts in the morning; but it is a despicable practice to give blue pill in every disease connected with the digestive function. And it is much to be regretted, that the great name of Abernethy should ever have been associated with such insufferable quackery.

The above treatment is to be persevered in for a long time, changing the diet and the laxatives now and then, but continuing the contra-irritation and application of leeches alternately. After a time, cold bathing in the open sea may be cautiously tried; the shower bath, or sponging the body with vinegar and water, often produces the best effects.

Third Stage of Indigestion.—It is not necessary to give a description in this place of the symptoms in the third stage of indigestion, and the proper mode of treatment, because these must vary according to the organ diseased, as well as the nature and extent of the affection.

The disease termed dyspeptic phthisis by Dr Wilson Philip,

is only met with, generally speaking, in cases of long standing. My experience, however, leads me to state that bronchitis is the primary affection in such cases, the tubercles form subsequently, and only in subjects highly predisposed.

Flatulency and Tympanitis.—These are symptoms of dyspepsia, but require a few separate remarks, along with water-brash and heart-burn.

Some people suffer extremely from flatulency and acid eructations. Five or six instances have fallen within my observation, of individuals who frequently passed enormous quantities of flatus upwards; and it is presumed these are cases to which Dr Mason Good would apply the term *cholera flatulenta.* In all such instances, the patients had previously eaten some crude vegetable substance: generally, the ordinary salad mixture, or radishes. The remedies which seemed to afford the greatest relief were æther, aromatic spirit of hartshorn, warm brandy and water, or brandy by itself, and essence of peppermint.

Tympanitis may be detected by percussing the abdomen; it is often a troublesome symptom, not only in this affection, but in fever; and the best remedy which can be used is turpentine. It is better to try it, in the first place, by injection, in the proportion of a table spoonful to eight or ten ounces of thin gruel, which the patient is to retain as long as possible. If this plan do not succeed, half an ounce is to be given by the mouth, with the same quantity of castor oil.

Infants, during the first months, frequently suffer very much from flatus in the stomach and bowels, which will in general be found to depend on the pernicious and unnecessary custom of giving them castor oil and other medicines to open their bowels, and food they are unable to digest. In truth, the moment an infant is born, and often before it is dressed, castor oil is exhibited, which frequently produces griping; this is attributed to wind, and want of something to eat, therefore a quantity of gruel is then given, which often increases the child's sufferings; Dalby's carminative is at last exhibited, which affords temporary relief. Few infants can be expected to thrive well under such bad management. The usual remedies for flatulence in infancy are, dill water and oil of aniseed.

Pyrosis, or Water-Brash.—In some long standing cases of

indigestion, particularly in old people, in women more than men, and those who live principally upon farinaceous food, a considerable quantity of limpid fluid is discharged from the stomach by eructation. This is the affection which is called water-brash. It is a symptom of scirrhus of the stomach also.

It attacks the patient generally in the morning and forenoon: at first considerable complaint is made of pain in the pit of the stomach, faintness, a sense of tightness, as if the stomach were closely drawn up to the back bone, and the uneasiness is increased upon moving into the erect posture; at last the limpid fluid is discharged in considerable quantity at different times, when the pain subsides; sometimes the fluid has an acid taste, but in general it is stated to be insipid. Occasionally the discharge takes place without being preceded by any severe symptom. Laxatives and the oxide of bismuth, together with change of diet, are the best remedial agents in this complaint.

Heartburn is, next to flatulency, one of the most frequent symptoms in indigestion, and it is also one of the common attendants on pregnancy. When heartburn exists, the patient complains of a burning pain in the pit of the stomach; every kind of food creates acidity; and hot, acrid eructations take place, which seem to irritate the œsophagus. Some women suffer very much from this symptom during the whole course of pregnancy, but the moment delivery takes place, it generally vanishes like magic.

Henry's calcined magnesia, and careful attention to the diet, often mitigate this symptom. The carbonate of soda and potass are frequently used, and sometimes with benefit; as also, charcoal and chalk mixture. The remedy which will be found most successful in producing temporary relief, is the common extract of liquorice. Cases are now and then met with, which resist all these remedies, together with leeches and opiates. The oxide of bismuth, in doses of 15 or 20 grains, is often serviceable. Sulphate of iron, and sulphate of zinc, have been highly extolled. I have exhibited them often in such instances, but without benefit. The points to be chiefly attended to, are the regimen and laxatives.

GASTRODYNIA.

The stomach is liable to a neuralgic affection, which is known by this name, as well as by the term *Cardialgia*. Gastrodynia is closely connected with dyspepsia, often occurring as a symptom; but it may exist as the primary disease; sooner or later, however, the digestive powers suffer.

Symptoms.—Sometimes the appetite remains good; but in general it is impaired. There is a gnawing pain in the stomach, extending very deep to the back, accompanied by anxiety, sense of constriction, tendency to eructate or to vomit, with occasional faintness, sometimes headache and constipation, and the patient is occasionally relieved by eructation; a considerable quantity of limpid fluid is sometimes discharged; in fact, this affection is often complicated with pyrosis. After a severe attack, a patient sometimes escapes without another, for a week, a month, or even a longer period.

All the symptoms enumerated do not take place in every case; sometimes there being only pain and anxiety, with some nausea, which are increased after taking food. This affection is almost unknown before the age of puberty. Besides, depending on a diseased condition of the nerves of the stomach, it is probably occasioned by a diseased state of the pancreas, spleen, and liver. Sometimes it is produced by scirrhosities of the stomach and duodenum, and it is also a very troublesome attendant on gout. This disease has of late years excited a great deal of interest in France, as well as in this country; and although no additional light has been thrown upon the nature and seat of the disease, still very considerable practical advantages cannot fail to be derived from perusing the writings of M. Barras, and Dr James Johnson.

The chief causes of gastrodynia, generally speaking, are supposed to be, long-continued use of indigestible food, very hot or very cold drinks, dram-drinking, long fasting, worms. The chief articles which produce a paroxysm in an individual liable to the affection, are salads, and other crude, uncooked vegetable substances, cheese, sweat-meets, new bread, cherries, nuts, olives, and above all perhaps, roasted chesnuts. The

cure depends, therefore, upon avoiding such articles in future, together with fat, oils, and butter.

During an attack, a vomit will often suddenly check it, if exhibited within two or three hours after the offending matter has been eaten; hot flannels are to be applied to the epigastric region; gentle laxatives, and the warm bath, are to be employed, together with bitters, alkalies, magnesia; and in bad cases contra-irritation is to be persevered in for a considerable time. I have known one or two patients, who for many months at a time could not put any kind of food into the stomach, without previously taking a small dose of the sedative solution of opium; and we are told by Roche and Sanson, that in the worst form of this disease, which had resisted bleeding, bitters, and antispasmodics, Dr François found lactucarium successful. It is a curious fact, that although sweet things generally aggravate the complaint, the extract of liquorice frequently alleviates the pain considerably. M. Barras insists much upon the necessity of making the patient take animal food, although it may for the time increase his sufferings; but to this treatment I cannot subscribe my assent,—that kind of food is best for the patient, which occasions the least distress after it is taken into the stomach.

CHAP. IV.

DISCHARGES OF BLOOD FROM THE STOMACH AND BOWELS.

I. *Hæmorrhage from the Stomach.*—This form, which is termed Hæmatemesis, is sometimes occasioned by diseases of the liver and spleen, and takes place also occasionally in fevers; but these are not under consideration at present.

Hæmatemesis most frequently attacks women, particularly those who are unmarried, of a plethoric habit, and at times when there is an obstruction, or some other irregularity of the menstrual discharge, and who are constipated. Each attack is generally preceded by a rigor. Pure blood is seldom vomited, unless from external violence, or the erosion of the coats of a blood-vessel. This discharge rarely coagulates, and seems rather to be the product of passive hæmorrhage, or exudation from the minute vessels of the mucous membrane. It is supposed to be a very easy matter to distinguish this affection from those hæmorrhages which take place from the lungs. In hæmatemesis, it is said the discharge is preceded by a sense of weight, pain in the region of the stomach, and that it is unaccompanied by cough, &c. But these distinctions will not answer in practice, and it may be of great consequence to a medical man, that he should not give an assurance of safety, in a case which may prove fatal in a few minutes, as the following instances will shew. A child was attended by Dr Yates, when that excellent gentleman was a pupil at my Dispensary. It had been for some time complaining of cough and anomalous symptoms, which were relieved from time to time, and it was able at last to go to school as usual. Still

it occasionally discharged a little blood, and died suddenly after *vomiting* a considerable quantity. On dissection, the stomach was found filled with a coagulum, and there was also a considerable portion in the small intestines in a fluid state. It was evident that there had been active hæmorrhage, but after the most minute investigation, no blood-vessel could be found from which it had issued. The relations began to complain of the time we had been over the body, and at length became very impatient, so much so, that we were obliged to give up further examination; but the whole of the contents of the thorax, including the œsophagus and great vessels, having been carefully dissected out, were surreptitiously conveyed to my museum for minute inspection; and it was discovered that the blood found in the stomach and bowels, had proceeded from a ruptured artery in a cavern in the superior lobe of the left lung. A fistulous opening was found running upwards from this cavern, and communicated high up with the œsophagus; so that when ulceration produced a rupture of the vessel, the blood passed in this direction, and found its way into the stomach. The preparation is in my museum, together with an accurate and beautiful drawing by my friend Dr Alexander Thomson, an enthusiastic pathologist.

Another remarkable case occurred in the Dispensary practice, in an old man. He had enjoyed remarkably good health until lately, when his appetite became impaired, and he complained of dyspeptic symptoms, which gradually increased in severity, and he was at last reluctantly obliged to seek for medical advice, at the age of 72, for the first time, I believe, in his life. He complained of so much uneasiness in the region of the stomach, that he was cupped several times, and contra-irritation was produced over the part affected, with considerable relief. One morning he discharged a little blood, between the act of coughing and vomiting, and he soon died after passing a considerable quantity. Upon dissection, it was a subject of general remark, that the external appearance of his body, as to shape and plumpness, was more like that of a man half his age. Every internal organ appeared sound; but on cutting through the stomach into the duodenum, the pylorus was found thickened and indurated, and an ulcer about the size of

a horse-bean was discovered in the duodenum, on the surface of which the gaping mouth of a large artery was discovered, from which the hæmorrhage had taken place.

Treatment.—As the disease generally attacks plethoric individuals, and is seldom accompanied by debility or oppression, practitioners have no scruple in employing blood-letting during an attack, and it is frequently speedily successful in checking the discharge, by altering the determination of blood, and reducing the force of the circulation. Quietness, cold acid drinks, and a course of laxative medicines, are also essentially necessary. If the hæmorrhage recur after bleeding, or should it take place in a constitution already debilitated, the acetate of lead, either in solution or in the form of pill, in doses of two or three grains, and one of opium, every second or third hour, will be found serviceable.

II. *Hæmorrhage from the Bowels.*—This was formerly known by the term Hæmorrhoidal Flux, and it was believed by the ancients to be salutary; but now such a discharge is always regarded with anxiety, as it tends to undermine the constitution, and like other long-continued hæmorrhages leads to affections of the brain,—a remarkable and fatal instance of which lately fell under my observation.

When blood is discharged by stool, it will sometimes be found to proceed from an injury done to the verge of the anus by a hard and constipated stool, from a ruptured blood-vessel in the bowels, or from the diseased excrescences which are found at the termination of the rectum, known by the name of hæmorrhoids, vulgarly called piles. These have been divided into two kinds, external and internal, which last are also called blind piles. They may be said to be painful excrescences on the verge of the anus, or in the rectum, usually attended with a discharge of mucus or of blood.

The profession is not agreed as to their pathology; but after a careful examination of the opinions which have prevailed, and of the diseased parts themselves, I feel disposed to believe there are at least four distinct kinds of hæmorrhoids. 1*st*, They are sometimes nothing more than a varicose state of the hæmorrhoidal veins, with, perhaps, a slight thickening of the mucous membrane of the rectum itself. 2*d*, They are

formed by an effusion of blood in the sub-mucous tissue, which may either be subsequently absorbed, or become organised, with a slight thickening of the membrane. 3*d*, They are mere fungosities from the surface of the mucous membrane; and accordingly are found to vary very much in size, shape, and appearance. 4*th*, A prolapsed state of the mucous membrane of the rectum, which subsequently becomes indurated, and in a manner strangulated, by the contraction of the sphincter.

Symptoms.—Individuals who are thus afflicted, suffer only occasionally, and then it is said, in common language, they have "a fit of the piles." A sense of heat and fulness is felt in the rectum, attended with an occasional stinging pain, which is sometimes very severe and darting, increased when at stool, during which a quantity of blood is discharged, and a strong desire is experienced to sit and strain. After this has subsided, a sense of heat is felt for a few minutes. But when the piles are external, they often swell enormously; are very tender, however small they may be, and sometimes ulcerate. In this case the discharge may be constant, taking place, however, in small quantity at a time; on other occasions, there is copious hæmorrhage, followed by temporary relief from pain. When the inflammation runs high, induration of greater or less extent is left, in consequence, most probably, of effusion of lymph into the cellular membrane, to which strictures of the rectum may frequently be traced, and the formation of small hard tumours close to the verge of the anus.

Causes.—The injury done to the parts by the frequent passage of indurated feces; the use of aloetic purges; long continued exercise in the erect posture; sitting on a cold or damp seat; and every circumstance which impedes the flow of blood through the veins of the abdomen,—are causes of this complaint. The pressure of the gravid uterus, therefore, is sometimes a cause, as well as tumours affecting different parts of the uterine system, and diseases of the liver, &c. But it will be almost invariably observed, that individuals affected with piles, have been long and seriously afflicted with gastro-intestinal irritation.*

* The pernicious habit of taking a book or newspaper to read in the water-closet, when at stool, is not an uncommon cause of this unpleasant complaint.

Treatment.—The bowels must be kept constantly well regulated by the gentlest laxatives, carefully abstaining from the use of aloes in any shape. A large mucilaginous injection, exhibited immediately before going to stool, will be found highly serviceable, and the best way of preparing it is by making a decoction of linseed. Sulphur has been erroneously supposed to be a specific. Balsam of copaiva was recommended by Dr Cullen as an injection; but in the ordinary cases of blind piles, gentle laxatives, occasional injections of decoction of linseed, together with rest in the horizontal posture, and a moderately antiphlogistic regimen, will suffice. When the piles are external, tender, and inflamed, the application of leeches, or punctures made with a lancet, are often productive of great benefit, by diminishing the tension and pain. In severe cases, the recumbent posture is actually necessary, and I have seen the inflammation run so high, and attended with so much suffering, as to require general bleeding. Poultices and warm fomentations are very serviceable in alleviating the pain, and sometimes anodyne injections must be had recourse to; considerable relief is obtained, if the excrescence can be pushed within the sphincter. An ointment, made by mixing equal parts of powder of galls and opium in hog's lard, and a weak solution of nitrate of silver, are frequently beneficial.

If a great deal of blood be lost, whether at once or at different periods, a careful examination should be made with the eye, as well as the finger, in order to ascertain the exact point from which the bleeding proceeds, and it is necessary sometimes to apply caustic, a ligature, and even the knife; but these are matters of surgery. I would only further beg to insist upon the necessity of attending to the constitution more than is generally done in these cases, and particularly to the general condition of the mucous membranes; and young practitioners should bear in mind, that neglected cases of piles often terminate in fistula.

CHAP. V.

COMMON COLIC ; PAINTER'S COLIC ; ILEUS, INTUS-SUSCEPTION ; INTESTINAL CONCRETIONS ; PROLAPSUS ANI ; AND CONSTRICTION OF THE RECTUM.

I.—COMMON COLIC may be produced, among other causes, by indigestible food, constipation, and a diseased condition of the biliary secretion.

Symptoms.—Griping pains and flatulent distention of the bowels, with a sense of twisting in the region of the navel, are felt, sometimes with contraction of the abdominal muscles ; and occasionally, though rarely, with some degree of nausea and vomiting, which takes place more frequently, when the affection is produced by the biliary secretion, and in which case there is generally looseness of the bowels. Flatus is sometimes heard rumbling backwards and forwards in the bowels, which is more classically termed " Borborygmus." The pain comes on in paroxysms, during which the patient thinks he experiences relief by pressure applied to the abdomen, which in general distinguishes the affection from others of an inflammatory nature. But it must be recollected that cases of colic, when neglected, often terminate in inflammation of the bowels.

Treatment.—It is a most essential point to obtain free evacuations from the bowels speedily, particularly by means of an injection ; certainly the best is composed of tobacco, in the proportion of half a drachm infused for ten or fifteen minutes

in eight or ten ounces of boiling water; to be strained, and exhibited when sufficiently cool. If the attack succeed immediately after a meal, an emetic may be given to dislodge the offending matter. Oil of cloves should be administered along with castor oil, or any other purgative; or oil of turpentine may be used by injection. Warm fomentations to the abdomen, or the general warm bath, may be employed.

Some cases of abdominal inflammation are attended by symptoms so slight as to resemble colic very closely, so much so, that in many instances it is difficult, and in some impossible, to determine this point of diagnosis.

In such circumstances, it will be well for our patients if we do not attempt to refine too nicely; if in doubt whether the case be one of inflammation or of colic, it is our duty to give the benefit of that doubt by using the lancet, particularly if the bowels are obstinate. The advantage of opium is very doubtful till the bowels have been properly moved, and the evacuation examined.

In a case of colic from vitiated bile, diluents, such as barley water, are to be employed, together with a weak solution of salts, and afterwards opiates. If the bowels be open, and we are perfectly satisfied that there is no danger of inflammation, a stimulant, such as brandy, is often beneficial.

Some women, at the menstrual periods, have griping pains in the bowels, more particularly in the course of the colon, accompanied by considerable distension of the abdomen, attended or not by constipation; frequently the pain extends from the caput cæcum to the arch of the colon. The best remedy in such cases, is a turpentine or assafœtida injection, combined with warm fomentations, proper regulation of the bowels and diet, and sometimes the warm hip-bath.

PAINTER'S COLIC.

This is also known by the names, Colica Pictonum, Devonshire Colic; and in the West Indies it is commonly called Dry Belly-ache.

This is the form of colic produced by the introduction of lead into the system, whether in food, by respiration, or cuti-

cular absorption. It is a disease which was long known and described before its cause was discovered. The discovery was made in Germany about one hundred and thirty years ago, by detecting publicans putting a preparation of lead into their wines. It is said that the disease used to prevail in Devonshire, and other places where cider is manufactured, in consequence of putting lead into the casks, to render the cider sweeter. The disease also prevails in the neighbourhood of smelting furnaces and lead mines; indeed, it is even said, in such situations, to affect the lower animals, such as poultry, pigs, &c. House painters, plumbers, potters, glaziers, and all who are compelled by their occupation to handle lead, are subject to this disease, particularly if they are not well guarded by personal cleanliness. Sir George Baker* was the first who drew the attention of the profession in this country to this interesting subject. It must be mentioned, however, that cases do occur displaying the same phenomena, course, and termination, which have been produced by exposure to cold and damp, when there could not be the most remote suspicion of the action of lead upon the system.

Symptoms.—The pain never leaves its principal seat about the umbilicus and pit of the stomach; at first it is dull and remitting, but gradually increases to be very severe and constant. The pain, in some severe cases, strikes through the back, and patients have told me that it resembled a stab through the body, others have felt as if they were cut in two at the umbilicus. In other cases, the pain extends to the arms and hands, down the back and pelvis, often affecting the lower extremities. The integuments of the abdomen feel retracted and hard, and I have seen the strongest men rolling and weeping like children. The whole surface sometimes suffers from pains, which the patients ascribe to rheumatism; there is always constipation, sometimes tenesmus, and occasionally sickness and vomiting. The sickness and vomiting are most se-

* Vide Papers in the 1st and 2d Vol. of the Trans. of the Lond. Coll. of Physicians.

vere at the height of the paroxysm; acrid mucus is sometimes vomited, or bile mixed with mucus, affording temporary relief. Hiccup sometimes supervenes, together with retraction of the testicles.

It is a matter which strikes every one with astonishment, that notwithstanding the violence of the symptoms, and the excruciating sufferings of the patient, the pulse is rarely much affected till the disease goes on for some time; in the end, however, it becomes quick and small. It has been remarked by some, that the feet and toes are occasionally affected, as in gout.

Spontaneous relief is said to follow a copious discharge of scybalous matter, like sheep's droppings, mixed with mucus and considerable quantities of blood. Occasionally, it is said, sweating produces a crisis. Sometimes the disease produces palsy of the superior extremities, and occasionally it terminates in death, which is preceded by a loss of sight and hearing, delirium, and convulsions. One attack leads to another; that is to say, a predisposition is left.

Colica Pictonum is a most afflicting disease to treat; for, do what we will, the patient is seldom relieved under a week, even when well managed, and relapses often take place at times when he is apparently doing well. He may be pronounced to be in great danger, however, when there are delirium, violent spasms, and convulsions.

Appearances on Dissection.—The following is an abstract of the appearances found on dissection, in the bodies of a number of individuals who died of this affection in the hospital of Beaujon, under the care of M. Renauldin. Redness, thickness, and ulceration of the mucous membrane of the alimentary canal, and often enlargement of the mesenteric glands, corresponding to the inflamed or ulcerated portions of this membrane. The redness varied from that of bright rose even to violet and brown; it was disposed in points, in streaks, and patches, and sometimes occupied an extent of several feet. The thickness was variable. The ulcerations were found almost always toward the termination of the small intestines, near the valve of the colon, which was sometimes destroyed; and in cases where diarrhœa prevailed, ulcerations were found in the colon;

and sometimes they were observed in the stomach. They were occasionally deep, and numerous; sometimes the stomach and intestines were perforated.*

Treatment.—The nature and seat of this disease are imperfectly known; but there can be no doubt, from the symptoms during life, and the appearances found on dissection, that it is probably seated, in the first instance, in the nervous system, and that we have to dread inflammation of the mucous membrane of the stomach and bowels. I can speak confidently, from experience, of the good effects of local bleeding by repeated cuppings and leechings on the abdomen and flanks. Many entertain an unaccountable dread of opening a vein in these cases, perhaps from prejudices of education; since I have seen the above account of the appearances on dissection, my objections to it are so far removed, that I shall hereafter try V. S. on proper occasions.

The remedies of the first importance, are calomel and opium, given in pills containing four or five grains of each, repeated at short intervals, so as to affect the system as speedily as possible. This remedial means has been strongly recommended by my friend Dr Musgrave, of the Island of Antigua.

One of the most severe cases of Colica Pictonum that ever fell under my care, occurred since the publication of the 1st edition. The patient was an apothecary's shop-man, aged 32, previous health good, and habits regular. The attack appeared to be owing to bathing the feet several times in a solution of acetate of lead, to suppress a fetid perspiration. In this case the paroxysms of pain were very distressing; the abdomen hard and distended; the features sharp and anxious, with hiccup and vomiting. The pulse did not exceed 80 till after V. S. had been twice repeated, and large doses of calomel and opium administered, when it rose to 110. V. S. produced no relief; tobacco injections, fomentations, &c. were used in vain. The symptoms, however, became much mitigated after the third large dose of calomel and opium, conjoined with croton

* Vide Roche and Sanson, vol. i. p. 528. These authors inform us that M. Renauldin had two hundred and seventy-five cases during the years 1821-22-23.

oil. He relapsed certainly, but was convalescent on the third day, and recovered progressively.

The bowels are extremely torpid in this disease, therefore common remedies must not be depended on; croton oil in doses of two, four, and six drops, must be given repeatedly at proper intervals, still continuing the calomel and opium. Turpentine is to be exhibited, both by the mouth and by injections. Large injections are to be administered; sometimes stimulating, at others unstimulating. Hot fomentations are to be applied; contra-irritation, when the disease is on the decline, which is to be for some time persevered in during the convalescence. The nitrate of silver has been strongly recommended in three, five, and six grain doses, in pill, three times a-day.* Dr Percival gave fifteen grains of the sulphate of alum every fourth, fifth, or sixth hour; and he assures us the third dose seldom failed to alleviate the pain.†

It is proper to mention, that Dr Reynolds has the credit of being the first who proved the powerful influence of opium over the morbid action produced in the system by lead.

ILEUS.

The attack comes on exactly like a common colic; vomiting takes place, which subsequently becomes incessant; sometimes even feculent matter is discharged by the mouth, and the abdomen is much distended. The symptoms vary much in intensity. Sometimes the pain is severe, amounting to *tormina;* at others it is slight. In some cases the febrile symptoms run high, in others there is no fever. In this case, and even in common colic, the abdomen should be minutely examined with the hand, to ascertain whether or not a hernia exists; for I have seen two or three instances where much valuable time was lost, in consequence of mistaking a case of hernia for colic.

Appearances on Dissection, and Pathological Remarks.—Considerable dilatation of one part of the intestine is generally

* By Dr Robert, 5th Vol. Med. Trans.
† Vide 2d Vol. Ed. Med. Essays.

seen, while the continuous part is contracted; the parts above the contracted portion, are distended with fluid and flatus. Sometimes the intestine is of a livid colour, inflamed, and even mortified. At other times there are marks of peritoneal inflammation; and on some occasions, gangrene, without peritonitis.

In treating of the nature and seat of this disease in the 1st edition, opinions similar to those of Dr Abercrombie were advanced, viz. that the disease probably consists of "a paralysis of the muscular coat of a part of the intestinal tube, which leads to great dilatation; while the continuous portion of the bowel is contracted, which produces a temporary obstruction." "But, (it was added,) there is much ambiguity on this subject." Since that period I have thought frequently on the disease, and from an interesting conversation with Dr William Stokes of Dublin, one of the most ardent and accurate pathologists in this country, I have become convinced that Dr Abercrombie's views are erroneous.

In fatal cases of ileus, the bowel has been generally found in two opposite conditions,—one part contracted like a cord, and another part above much dilated. The point to be determined is, which of these is the primary seat of the affection? Dr Abercrombie thinks it is the dilated portion, and that "*the doctrine of spasm, as applied to this subject, must be admitted to be entirely gratuitous; and we must proceed upon facts, not upon hypothesis, if we would endeavour to throw any light upon this important pathological question.*"* In the last sentiment I most cordially agree; and as the author has substituted hypothesis for facts, I shall shortly state several reasons for dissent.

1*st*, Dr A. avers, that "*the collapsed state of the intestine, in which it assumes the form of a cord, appears to be the natural state of healthy intestine.*" "*That in a case of ileus, the distended part is the real seat of the disease; and that the contracted part is not contracted by spasm, but is merely collapsed because it is empty, its muscular action being unimpaired.*" P. 136.

* Researches on the Bowels, p. 134.

We submit, that the cord-like contraction is not the natural state of intestine. If it were the natural condition of parts, it would be always seen on dissection, when the bowels are unaffected by disease, whereas it is avowedly rare, and according to our observations, is only seen when the intestinal tube is in a morbid state. This appears to be satisfactorily proved by Andral, Billard, and others. We have examined the bowels of animals, opened during life, and on no occasion found the tube in the state which is asserted by Dr Abercrombie to be natural.

2*d*, It appears to us that Dr Abercrombie does not connect ileus with any known pathological state. He considers ileus to be a great and uniform distention of a part of the intestine, with loss of power of its muscular fibres. In short, he supposes the distended intestine to be in the state of paralysis, and that this is the primary disease. He states, also, that the "usual progress of the disease is into inflammation and its consequences," p. 138.

Dr Abercrombie cautiously avoids the term "paralysis;" but it must be admitted, that loss of muscular power proceeds either from paralysis, or inflammation in the part:—if paralysis, it is the opposite of the state of irritation, for nervation is abstracted, not added:—if inflammation, then Dr Abercrombie is wrong; but in neither case can he be correct.

It will be observed, also, that he does not denominate the cord-like state of the intestine "*contracted*," which he ought, but "*collapsed*," which term he ought not to have employed, because it conveys any thing but a correct notion of the actual state of parts.

3*d*, When we speak of a muscular organ such as the intestine, we must admit spasm to be possible, nay, probable; and we cannot therefore admit the doctrine of spasm, as applied to this subject, to be "*entirely gratuitous*." No one denies the muscularity of the intestines, and that they are capable of contraction, which implies an increase of nervation. If Dr Abercrombie's idea were correct, the bladder should never fill, nor the heart, nor the feces pass through the intestine, unless muscular fibre could be *stimulated to dilate*. But it will be proper to allow Dr Abercrombie to speak for himself: "If

we suppose then that a considerable tract of the canal is in a *collapsed* state, and that a mass of alimentary matter is propelled into it by the contraction of the parts above, the series of actions which will take place, will probably be the following: When a portion which we shall call No. 1, is propelling its contents into a portion of No. 2, the force exerted must be such, as both to propel these contents, and also to overcome the *tonic contraction* of No. 2. The portion No. 2, then contracts in its turn, and propels the matter into No. 3.; this into No. 4, and so on." P. 136.

It will be readily seen, on looking at the parts, that the empty intestine is not in a state of "*tonic contraction*," as Dr A. asserts, and that it offers no resistance to the alimentary mass, which is propelled onward by the contraction of the superior portion of intestine.

4*th*, If the dilated intestine usually passes into inflammation and gangrene, and its seat be in the muscular coat, its first stage must be one of irritation. The effect of irritation on muscular fibre is, to suddenly and powerfully contract it. The parts may become dilated afterwards, but the first effect will be contraction—and the contracted, of course, the diseased portion. It follows then, as a necessary consequence, that *if it be spasm*, the contracted is the diseased portion; or if, according to Dr Abercrombie, it be disease of the muscular fibre, still in the first instance the same will occur.

Ileus, according to Dr Abercrombie, is either a paralysis, or an irritation of the muscular fibres of the intestine, usually terminating in inflammation and gangrene. Could any two things be more opposite? If it be a paralysis, it is either general or local. It is not general, because all the symptoms are those of violently increased action, *colic, vomiting, spasms of the abdominal muscles, and paroxysms of tormina!* Tormina and loss of power together? If it be local, it is at all events accompanied by increased muscular action—spasm.

If the primary diseased action be connected with irritation, as we imagine, the first effect will be to contract the parts.

Lastly, It may be asked, does the treatment coincide with the doctrine of paralysis, or that of irritation and spasm? After describing the treatment, I shall return to consider this important question.

Treatment.—The chief attention must be directed to prevent and subdue inflammation, and to employ every means to move the bowels. For this purpose, the milder laxatives frequently repeated, assisted by tobacco injections, are to be had recourse to. If these fail, then we may entertain the question of bleeding, particularly if the case be not far advanced, and if there be pain on pressure. Leeches may be applied; but still we must not lose a moment in endeavouring to procure stools. Although we may mitigate the symptoms by bleeding and leeching, yet we may rest assured that a relapse will take place in the course of an hour or two, unless the bowels are relieved. Dashing cold water upon the belly has sometimes succeeded. When the gut is supposed to be obstructed, mercury in its pure metallic state has been recommended to be poured into the stomach in considerable quantity, in order to force a passage. Once I was present at a dissection, when the obstruction existed at about six inches from the termination of the rectum; and since then I have met with two cases of ileus, which were produced by constriction of long standing of the rectum; therefore I think, in all severe cases of this sort, that a long œsophagus tube should be introduced into the rectum, and if possible, pushed forward into the sigmoid flexure of the colon.

This is one of those diseases in which we frequently succeed in procuring passage from the bowels after bleeding, which had previously resisted the strongest purgatives; it is also one in which large opiates may be advantageously combined with laxatives. Opium generally acts by confining the bowels; but in the case now before us, it seems to increase rather than diminish the laxative effect of medicines. During recovery it may be adviseable to apply contra-irritation.

It has been already asked, if the most improved remedial means coincide with Dr Abercrombie's hypothesis? Bleeding, tobacco enemata, full doses of opium, and contra-irritants, to cure a disease which is a simple loss of the muscular power of a portion of the intestinal canal? The circumstance cannot be reconciled upon principles of pathology. Much real injury is done to the advancement of medical science, by the construction of such distorted theories; and I cannot resist

quoting a passage from the preface of Dr Abercrombie's work on the bowels, which bears on the present question. Speaking of the circumstances which have retarded the progress of medicine, he says, there are two errors committed—the one is the "*construction of hypothetical theories, or the assumption of principles which are altogether gratuitous and imaginary; the other is the deduction of general principles or conclusions from a limited number of facts.*" P. 8.

INTUS-SUSCEPTION.

INTUS-SUSCEPTION, generally speaking, is a disease of infancy. There are the same symptoms as described in ileus, only that in many cases there is violent straining; the patient passing more or less bloody mucus with each effort, in some instances exactly resembling red currant jelly. This, like all other affections, varies very much in the symptoms as to violence; this was well proved in two fatal cases occurring in the same family, which fell under my immediate notice. They were both male infants at the breast; the disease ran its course in three days; but the symptoms were very violent in one case, and very slight in the other. In both, a tumour was felt in the left iliac region, at the termination of thirty-six hours, which gradually increased in size, till it became as large as an orange. Both children strained much at stool, and passed mucus tinged with blood. I have known the disease terminate fatally in thirty hours.

Appearances on Dissection.—We often find partial invaginations of the small intestines. I scarcely ever open a child without finding them; but they are not to be regarded as intus-susceptions, unless the coats are thickened, with marks of obstruction and inflammation. At least so I thought when the first edition was written. Since then, however, I have become doubtful on this point, having discovered ulcerations in the intestines at each intus-suscepted part in every case which I have had an opportunity of examining. In the dissections of patients who die of intus-susception, it is the caput cæcum, and a portion of the ileum, which are commonly forced up the ascending colon across the transverse colon, and some-

times down to the sigmoid flexure. In one of the cases to which I have alluded, the caput cæcum was found in the rectum, very near to the extremity of that gut. Could such a transposition have taken place unless there had been some original malformation? I think not. Upon first opening the abdomen, in both cases mentioned above, the intestines looked displaced and twisted in a strange manner, and the caput cæcum was missed from its usual position in the right iliac region.

On slitting open the intestine at the point of obstruction, we find two *mucous* surfaces highly inflamed, dark coloured and thickened, and covered with a considerable quantity of effusion of a red colour, intermixed with whitish matter like coagulable lymph. On laying open that part of the intestine which is invaginated, we then expose to view two *serous* surfaces, which are also found in a state of inflammation, with exudation of lymph and adhesion.

Treatment.—The same plan is to be had recourse to as in ileus, only this is altogether a more hopeless case; we are to be more guarded in using strong purgatives, lest we increase the torments of the poor little sufferers. It is said that a natural cure sometimes takes place by a spontaneous separation of the intus-suscepted portion of gut; and in every extensive collection, a preparation or two of this kind is exhibited.

INTESTINAL CONCRETIONS.

Some remarkable cases of this kind are on record; but man is not nearly so liable to the complaint as some of the lower animals. A case is published in the eighth volume of the Edinburgh Medical Communications, by Dr Fitzgerald. The patient, a lady, suffered extreme pain in the hypogastric region, the back, and os sacrum, for eighteen months; during the last three of which she could not leave her bed, except to be put into the hot bath, which afforded only temporary relief. One day, after receiving an injection, a large, hard, calcareous ball, of an oval figure, was discharged. It exceeded in size an ordinary orange, and was so solid, that it required the stroke of a hammer to break it. It weighed eight ounces and three drachms.

Sometimes there are several of these concretions; in that

ease, they may be heard rattling upon percussing the abdomen. Many curious instances of this affection are related in the Philosophical Transactions. The late Dr Marcet wrote an essay on the chemical history and medical treatment of calculous disorders, wherein notice is also taken of several interesting cases, to which, as well as to the first volume of Good's Study of Medicine, I must refer the reader.

It is alleged that the inordinate use of chalk and of magnesia in dyspeptic and calculous complaints, leads to the formation of these substances. Mason Good mentions a case of a lady whom he had once attended; she "laboured under a most painful constipation, till a large mass of what may be called intestinal mortar, was removed by a scoop from the rectum." P. 297, vol. 1st.

Treatment.—If the nature of the disease be discovered, large mucilaginous injections ought to be frequently administered, alternately with those of an anodyne nature, to allay irritation. Blisters and leeches may sometimes be necessary, to allay internal pain, and moderate any inflammation that may arise. If such substances can be felt through the parietes of the abdomen, as is alleged, it may perhaps be possible to push them on, daily, in the course of the bowel towards the rectum. In females, I can conceive it to be very easy to break them down when they arrive in the rectum; and considerable assistance will be afforded by introducing one or two fingers into the vagina. The warm bath is not to be neglected.

PROLAPSUS ANI.

By this term is understood the protrusion of a portion of the mucous membrane of the rectum, the sphincter contracting forcibly, and producing a temporary stricture. *Prolapsus ani* depends either upon a temporary want of power on the part of the sphincter ani, or some violent irritation in the rectum, producing great straining, which, in medical language, is termed tenesmus, during which the mucous membrane is protruded. It is now much more rare than formerly, owing to greater attention paid to the bowels of children, who are generally the subjects of this complaint. Formerly a pernicious custom prevailed of endeavouring to produce a stool, by making

children sit upon a pot containing a little boiling water, instead of giving them physic.

Symptoms.—The protrusion takes place when the child is bearing down at stool, or making water; it begins to cry most violently, from pain in the part affected, and the protrusion takes place. On making an examination, the mucous membrane is found of a dark red colour; the protruded portion is of various sizes, sometimes as large as a small orange. Formerly a piece of scarlet cloth was applied to the part by the women, under the idea that it would be thus reduced; but now almost every nurse knows how it should be reduced. The child being placed on the back, gentle pressure is to be applied to the protruded portion of gut, by the thumbs of the operator, which have been previously dipped in oil.

People advanced in age are sometimes affected with prolapsus ani; it frequently depends upon diseases of the urinary organs, as well as of the bowels. The parts are occasionally so much relaxed as to require the use of a bougie, and sometimes of a bandage; or a more serious and painful surgical operation is necessary.

CONSTRICTION OF THE RECTUM.

Little need be said respecting constriction of the rectum in a work on the practice of physic; indeed, it is introduced only for the purpose of drawing the attention of physicians to the subject. I have seen several cases within these few years, in which many dangerous attacks of constipation might have been avoided, had the disease in the rectum been early discovered. This affection may be suspected in every case of habitual constipation, particularly in those instances where the patients have to strain long at stool before the least passage can be procured, which is followed by pain in the part, and frequent attacks of piles. Laxative medicines afford only temporary relief, and when too powerful, I have seen symptoms of ileus induced. The only remedy is to be found in the frequent introduction of the bougie. I have been lately consulted in two instances where symptoms of ileus were occasioned by this affection; both patients were permanently cured by dilating the stricture.

CHAP. VI.

INTESTINAL WORMS.

THERE are principally three kinds of Worms which infest the intestinal tube,—the Lumbricus, Tenia, and Oxyuris.*

1*st*, *Lumbricus*. It resembles the common earth-worm, and may exist in considerable numbers; instances are on record of upwards of fifty having been voided. Lumbrici lodge in the small intestines, and occasionally in the stomach, and are therefore frequently vomited. They often excite little uneasiness, but in some cases they create griping and considerable constitutional suffering.

2*d*, *Tenia, or Tape Worm*. Of this genus there are two species, the tenia solium, and tenia vulgaris. The first, as its name imports, is solitary; the second may exist in families. They generally take up their quarters in the higher parts of the intestines; for the purpose, as is supposed, of feeding on the chyle. Tape worms appear to be composed of a great number of pieces or animals joined together by articulations. In the tenia solium these articulations are long and narrow;

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* There is another kind of worm occasionally met with, the Trichuris; but of which I shall not treat, being more an object for the natural historian. Another species, never before described, has been lately discovered in my collection, by Captain Brown, an ingenious naturalist, and described as the Oxyuris Angulata in an excellent little work on Worms, by William Rhind, Esq. surgeon.

while in the other kind they are short and broad. The solitary tape worm has been known to measure between thirty and forty feet; and one extraordinary worm is mentioned by Dr Sibbargaarde of Copenhagen, which measured thirty-eight yards. The tenia vulgaris measures generally from three to twelve feet.

3*d*, *The Oxyuris* generally lodges in the rectum, enveloped in mucus; it is the smallest, being only like threads, from an eighth to a quarter and half an inch in length.

Worms chiefly exist in children and sickly adults, and are generally attributed to some diseased condition of the secretions in the alimentary canal. I believe the inhabitants of Great Britain suffer less from them than those of any other nation. Mr Marshall, Deputy Inspector-General of Hospitals, informs me that Europeans are very liable to lumbrici in India, and perhaps Africans are more so. Few *post mortem* examinations are made without discovering them. One negro passed forty lumbrici in one day; in seven days he passed altogether two hundred.

It is an interesting point to determine, whether worms are produced in the intestinal tube itself, or are generated from ova or animalcules accidentally swallowed with the ingesta. Various opinions have been maintained in support of each view. A case, however, occurred in the Session 1834–5, in the Veterinary School of Edinburgh, that convinced my mind of the truth of the former theory. A horse having died rather suddenly, was minutely examined by Mr Dick and his pupils, to discover the cause of death. Several small slender red worms, (the *Strongylus Armatus*,) were discovered in the intestinal tube. On examining the mucous membrane, the distinct follicles were observed to be very numerous, large, and elevated. On the surface of some of them, a dark-coloured spot was seen, which on close examination was found to be a hole, communicating with the interior of the follicles; in others it was wanting. Incisions were cautiously made, to expose the contents of the follicles that were without the opening, in each of which a small red worm, the *Strongylus Armatus*, was found, coiled up like a snake in its egg; the others were empty, but retained the impression made by their

late occupants, and a circular hole in the centre through which they had made their escape.

Worms frequently produce emaciation, swelled and tense abdomen, gnawing and slight burning pain in the stomach and bowels; irregular appetite; a pale, sickly countenance; foul tongue; fetid breath; irritation and inflammation of the nostrils, occasioning great itching and desire to pick the nose; occasional feverishness, particularly at night, producing restlessness and want of sleep. But none of these symptoms, nor all of them conjoined, point out the positive existence of worms, because they may be produced by any irritation or sub-acute inflammation in the mucous membrane; and it is too much the custom for medical men to conclude that a child has worms, if it be dull, look pale, and is observed with its fingers frequently in the nose. Besides these symptoms, worms occasionally produce violent colicky affections, with vomiting and purging, sometimes of blood; and I believe ulceration of the bowels, and even peritonitis, may be excited by this irritation. More rarely, cerebral symptoms, and even epileptic convulsions, take place. Children who are troubled with worms, often awake suddenly, screaming; and frequently are observed to grind their teeth.

Treatment.—The first thing to be done, is to endeavour to repair the digestive function, and at the same time, we must institute an exterminating war against such filthy intruders, by means of a class of medicines called anthelmintics. It is curious, however, that the remedy which appears to succeed in one or two cases, will disappoint our expectations in a number of others. Anthelmintics naturally divide themselves into two classes; one which operates mechanically, namely, ordinary purgatives, common oils, sulphur, sea-salt, tin-filings, cowhage; another, which has a peculiar poisonous effect on the animal, as oil of turpentine, hellebore, male fern, tobacco, rue; calomel, and other mercurial preparations. Of all these, oil of turpentine, calomel, jalap, and the cowhage, have been most successful. It deserves to be mentioned, that turpentine, in doses of from one to two ounces, is the only remedy which has hitherto been found generally successful in destroying the tenia. It has been mentioned to me, however, that a

decoction of the root of the pomegranate tree, is fully as successful. When turpentine is given by the mouth, care should be taken to have the bowels previously well opened, so that it may not be detained in the intestines. The condition of the stools must be watched, which, together with other symptoms, treated of under the head, "Usual Complaints of Children," will generally announce whether there be any considerable irritation or inflammation in the mucous membrane. Should such symptoms exist, the application of leeches, or of a contra-irritant, may be necessary.

CHAP. VII.

INFLAMMATORY AFFECTIONS OF THE ORGANS CONTAINED WITHIN THE CAVITY OF THE ABDOMEN.

GENERAL REMARKS.

Inflammations of the viscera have been distinguished, since the time of Boerhaave, by anatomical terms, derived from the name of the tissue or organ affected, with the addition of the Greek term, *itis;* as Gastritis, Enteritis, Peritonitis, Arachnitis, &c.

It would be an error to suppose that in inflammatory disorders, the constitution is always disturbed in proportion to the importance of the part affected, and the nature and extent of the diseased action. If the organ be a vital one, the disease is certainly attended with more danger, than if the inflammation attacked an ordinary muscle, or the cellular substance to the same extent; and the disease is much more rapid in its progress; but there is often more pain and a higher degree of fever when the inflammation is situated in the latter tissues, than in the brain, lungs, &c.

The constitutional suffering which happens when vital organs are affected with inflammation, is attempted to be explained by the term sympathy; it is said in medical language, "the organs sympathize with each other." Thus, Dr Good observes at page 384, vol. II. "When inflammation is seated in the heart, its action becomes extremely agitated and irre-

gular. When in the lungs, the heart, *possibly from sympathy*, does not seem to allow a free diastole."

It would afford me much real satisfaction, if the word sympathy were always employed in medical writings in a strict pathological sense, as I conceive it would be a great step gained in the practice of medicine. It is one of those vague terms too often employed to express a great deal more than we actually know, but which explains nothing; and I have frequently seen it highly injurious in practice,—thus, in inflammation of the stomach and bowels, I have seen the most deadly cerebral symptoms lighted up, which were not treated, because it was supposed the brain was only *sympathizing*, not really diseased. I have seen the same thing happen in fevers, gout, rheumatism, &c. The word sympathy means, strictly speaking, fellow feeling or suffering, and so far the expression is correct, because, as has already been explained in a former part of this work, diminished action in one organ leads to increased action in another, and any thing going wrong with one important function, embarrasses all the others. Here it will be remarked, that the organs secondarily affected are diseased, in as much as they are supplied with too little, or with too much blood; or, if the organ affected be excretory, something deleterious is retained in the blood, which poisons to a certain extent the stream of life, producing embarrassment in all other organs, although one may shew it more than another. Now all this shews fellow-suffering,—a tendency which one organ has to sympathize with another. It is to be lamented, however, that this expression is too often used in medicine, in the same sense in which it is employed in common conversation.

When inflammation is seated in the lungs, the heart actually does suffer, from two causes; first, because the function of respiration is impeded, and the changes produced on the blood in the lungs are not properly effected; and secondly, because the circulation through the lungs is obstructed. This is certainly accounting for the affection of the heart, better than by stating that it is "*possibly from sympathy*." The same thing happens to the lungs, when the heart is primarily affected; there is dyspnœa and cough, not from sympathy in its

ordinary acceptation, but from an increased or diminished supply of arterial blood; and also, by obstruction in the circulation. It may be thought by some, that this statement is quite unnecessary; but it is made under a strong sense of its importance, as I have often had to witness the baneful effects of the term in actual practice.

There is another term, which those who are young in the profession must be cautious in receiving,—it is the word "debility." It has already been shewn, that oppression and obstructed action are generally confounded with debility; and I shall take the liberty to make a few remarks with respect to this term, as applied to the system when labouring under inflammation.

Dr Mason Good, in noticing inflammation of vital organs, observes at the page last quoted, "The *debility* commences early, because the inflammation itself is immediately interfering with the actions essential to life." The term debility is usually employed in such cases to denote oppression, prostration of strength, inability to perform loco-motion; but if the inflammation be quickly removed from any organ by bold measures, the oppression ceases to be felt, and the strength is restored by remedies decidedly debilitating. This must ever be kept in recollection in treating inflammations in the first and second stages; otherwise, the term will be apt to induce young practitioners to follow the fashionable practice of giving bark, wine, and animal food, in cases in which they ought to bleed.

It must be recollected that inflammations are not always acute: perhaps they occur more frequently in a sub-acute or chronic form.

The term "*acute inflammation*," is employed to express the highest degree of this diseased action, which arises suddenly, advances through its course with rapidity, and if not properly treated, terminates in a few days, by altering the structure of the part affected so much, as to render it incapable of supporting life.

The term "*sub-acute inflammation*," is employed to denote a milder degree of inflammation than the former; it arises more insidiously, is less severe, and, if left to itself, does not

destroy the structure of the part affected till the second or third week.

In both these cases, we have the combination of symptoms denominated fever, which is higher, generally speaking, in the former than in the latter.

The term "*chronic inflammation*," is employed to express a diseased state which follows an acute inflammation that has been partly subdued, as we see sometimes in the tunica conjunctiva of the eye. This term is likewise used to signify an inflammation which begins and advances slowly and irregularly. The patient passes restless nights, with thirst, and a dry burning sensation of the hands and feet, while in the course of the day the extremities can scarcely be kept in comfortable heat; although he is always complaining, yet there is no severe general commotion during the day: he is able to sit up, to take exercise, and even for some time to go through his ordinary duties. His restless nights are too generally attributed to indigestion, proceeding from something which he has eaten or drank,—to an irregular state of the bowels,—want of exercise, or to something which had affected his mind; when perhaps the substance of the brain itself is undergoing slow destruction. In such cases, the common routine practitioner will be found prescribing his tonics, diaphoretics, diuretics, or blue pill, always treating some symptom, the actual disease being hid by an impenetrable cloud from his senses. At length the structure of the part becomes more and more destroyed, till all the symptoms called hectic are fairly established, or the patient becomes comatose.

These observations naturally lead me to notice other points in pathology. It is surprising to find how completely a vital organ may be altered in structure, without producing external signs or symptoms of corresponding violence, provided the diseased action has gone on very slowly. Another circumstance to be attended to is, that one individual, from peculiarity of constitution, will be destroyed by the tenth part of an organic lesion, which a great many others may survive for years, never certainly being entirely well, but able to transact their ordinary business.

The consideration of these circumstances, ought to induce

us, in our treatment of diseases, to go on steadily, guided as far as possible by the pathological condition of the body, at the time, without reference to accidental symptoms.

When treating of the congestive form of fevers, it was mentioned that inflammatory action might go on concealed under severe congestions. The same observations are equally applicable to purely inflammatory diseases.

ENTERITIC INFLAMMATIONS.

Under this title I shall treat, 1*st*, of Peritonitis. 2*d*, Of inflammation of the mucous membrane of the stomach. 3*d*, Of inflammation of the mucous membrane of the bowels, which will include diarrhœa, the bowel complaints of children, tabes mesenterica, dysentery, and cholera. 4*th*, Inflammation of the muscular and cellular tissues. 5*th*, Scirrhus of the stomach and intestines.

PERITONITIS.

I shall, in the *first* place, treat of inflammation of the peritoneum in the ordinary state of the system; 2*d*, peritonitis after delivery; 3*d*, a modification of peritonitis after delivery, the consequences of inflammation of the substance of the uterus, or of the uterine vessels and absorbents; and *lastly*, of the chronic form of the disease.

Cullen, by dividing peritonitis into three varieties, has been guilty of a great error, because no one can tell whether it is the peritoneum lining the cavity of the abdomen, or that covering the bowels, omentum, or mesentery, which is inflamed. Although he insists much on the propriety of this division, yet he observes, "it is not proposed, however, to treat of them here, because it is very difficult to say by what means they are always to be known; and further, because when known, they do not require any remedies besides those of inflammation in general.

Although peritonitis may take place most extensively, even to a fatal termination, without affecting the subjacent tissues, yet it is rare to see a case of inflammation of the muscular coat of the intestines terminate fatally, without finding the peritoneum more or less inflamed also.

Symptoms.—Like other acute affections, peritonitis commences with a rigor or chilliness, followed by re-action; occasionally, however, as in other diseases, peritonitis makes its approach in the most insidious manner.

The pain differs very much in its extent and severity, being sometimes so slight as scarcely to be complained of throughout the whole course of the disease; in others, so severe that the patient is unable to cough or to turn himself, and he complains even of the weight of the bed-clothes. The pain is commonly described as being acute tenderness rather than pain; it is sometimes so confined in extent, that the tips of the fingers can cover the part affected. The uneasiness sometimes commences in one part of the abdomen, sometimes in another. Generally it is first felt in one of the hypogastric regions; it does not, however, continue fixed and confined to one spot, but frequently spreads quickly over the whole abdomen. Before death, all uneasiness sometimes suddenly subsides, which is apt to impose upon the inexperienced; but the pain on other occasions continues to the last, and this is produced, I apprehend, by the extension of the inflammation. Tumefaction and tension of the abdomen occur early; in the first stage, it is produced by tympanitis, but late in the disease, the effusion produces distension. The pulse is not to be depended upon, as it varies much in different cases; sometimes it is full, strong, and quick, beating 120 or 130 in the minute, at other times it is strong and slow, sometimes weak and quick, and very often it beats at the natural standard; but towards the fatal termination it becomes rapid, weak, and intermitting. Vomiting is only an occasional symptom in peritonitis. The bowels are in general easily moved, drastic medicines are therefore not necessary. Thirst is a very general symptom in the pure inflammatory disease, but when the system is much oppressed by congestion, it is not urgent. The tongue is at first moist, and loaded with a white fur, but soon becomes dry and brown

in the centre, and frequently it is observed to be very red at the tip and edges. The breathing is soon affected, if the inflammation be extensive, from the pain which the motion of the diaphragm produces upon the tender peritoneum, as well as from the disordered state of the circulation. In the latter stage, however, the breathing becomes laborious, not only from the extensive effusion in the belly, and the increased disorder in the circulation, but frequently also from the pleura partaking of the inflammation. The brain, in most cases of acute and deadly inflammations of other parts, can scarcely escape embarrassment in its functions; therefore, we have almost always headache, if minute inquiry be made, and frequently delirium. When the peritoneal coat of the stomach is inflamed, the symptoms appear to be much more violent than when the disease affects any other part; the pain is more severe, the vomiting incessant and intractable; the features collapsed; the pulse small, and the powers of life sink rapidly;—this description will be found to correspond to that of the Gastritis of authors.

Causes.—Cold and fatigue, which occasion partial determinations of blood, and an irregular state of bowels, sometimes produce this disease, as well as contusions and wounds; sometimes it follows surgical operations.

Pathology.—Until lately this was not understood. Cullen was unacquainted with it, and so was Dr Gregory, I believe, to the latest period of his life. Many people of the present day, cannot fancy how it comes to pass that there is so much effusion with so little vascularity, but there is now no doubt that the effusion is produced by inflammation of the peritoneum itself.

In addition to the observations already made on the effects of inflammation on serous membranes, at page 21, &c. of this work, and those which will also be found at page 275, I may now remark, that the absence of vascularity is no proof of the non-existence of inflammation; pathologists rather trust to the well-known results of that action, which have also been established by experiment. Peritonitis was produced in dogs, which were then killed, and the vascularity, if recent, disappeared in the act of dying.*

* Vide Archives Genérales for December 1823, and January 1824.

Treatment.—Bleeding, both general and topical, is to be had recourse to; in very slight cases we may trust to local bleeding by leeches, but when the inflammation is severe, the lancet should be used to such an extent as the nature of the case demands, so as to make a decided impression upon the disease and upon the system. Some physicians are, I believe, still in the habit of ordering the precise quantity of twelve or sixteen ounces of blood to be drawn in all cases, whether the disease be slight or severe; the patient robust or weakly; at the beginning of the disease, as well as at any time during its progress. In all cases, the operator should be left to his own judgment as to the quantity, because he alone can judge of the effects, unless the physician chooses to attend himself. More than two or three hours should not elapse between the bleeding and the next visit, when it may be determined whether the operation ought to be repeated, or leeches applied. Perhaps it may not be found necessary to have recourse to either the one or the other, but we are nevertheless still to be on the watch. Laxatives are to be frequently repeated, assisted by large unstimulating tepid injections. There is no necessity in this disease for giving drastic purgatives, because the bowels are in general not difficult to move; and if they should be found obstinate, two grains of calomel, and six of rhubarb, repeated every three hours, will produce more satisfactory stools, with less danger of producing irritation, than five grains of calomel and a scruple of jalap. As soon as the bowels are opened, an opiate may be given if there be any restlessness. Fomentations with very hot cloths are often serviceable in mitigating the pain, but it is not yet decided whether they are more or less beneficial than cold applications. Blisters are not to be had recourse to till late in the disease; and when they are thought necessary in serious cases, the abdomen should be completely covered.

Many practitioners have great faith in digitalis in such cases, as a contra-stimulant, in doses of ten, fifteen, or twenty drops of the tincture, repeated four or six times in the twenty-four hours; but although I have seen it tried in many cases of peritonitis, it has never operated beneficially, and in such an acute disease, no confidence can be placed in any

remedy which requires that we should wait twenty or thirty hours for its effects in controlling the circulation. If a remedy of this class be wanted, we possess a far better one in antimony; and better still, in acute affections of the bowels, in tobacco, which is to be administered by injection.

If the patient be affected with distension of the abdomen from tympanitis, we have an admirable remedy in turpentine by injection, in the proportion of half an ounce, or an ounce, in eight or ten ounces of gruel, or it may be put into the tobacco injection. The regimen is to be strictly antiphlogistic.

PUERPERAL PERITONITIS, VULGARLY CALLED PUERPERAL FEVER.

The nature of this disease is inflammation, and its seat the peritoneum, so that it is exactly the same as the last affection treated of, but modified by the peculiar condition of the woman, and the nature of the prevailing epidemic.

Symptoms.—There are two varieties of puerperal peritonitis, the purely inflammatory and the congestive; and I shall hereafter explain the reasons why the latter more frequently occurs in the puerperal state, than in the ordinary condition of the system.

It is not necessary that I should enter into a detail of all the symptoms, because they are the same as those already described in common peritonitis. It will be sufficient to notice some of the peculiar symptoms which Dr James Hamilton, Jun. and other symptomatical physicians, call "*pathognomonic*," or, in other language, symptoms which are present only when the disease is present, and absent when the disease does not exist. These are pain in the belly, the state of the pulse, tympanitic distension of the abdomen, pain in the forehead, and the condition of the discharge which takes place after delivery, called the lochial discharge.

Mr Burns, as well as Dr James Hamilton, Jun. has endeavoured to make it appear, that in peritonitis the pain is very severe; whereas in what they choose to call puerperal fever, the pain in the belly is slight, or, to use the words of Mr Burns, "abdominal pain is not the most prominent symptom." Dr Hamilton is exceedingly angry at a statement made by me in

my work on "Puerperal Fever," that in his cases the pain in the belly was very acute, which he has been at much pains to deny in a letter printed in a celebrated pamphlet, which it has since been necessary to suppress; but that the Doctor has been guilty of a subterfuge not very creditable to him, is easily proved, by looking back at his own account of the symptoms of the disease, in the old editions of his work. In the edition 1813, page 202, will be found the following passage: "In many cases the pain in the belly is such, that the weight of the bed-clothes proves intolerable." But even allowing that the pain is often sub-acute, and not much complained of as a prominent symptom, it is no more than we frequently meet with in peritonitis in the ordinary state of the system. Dr Abercrombie, in giving an account of the pain in common peritonitis, says, "and in some cases, it is little complained of, except when pressure is applied, being rather acute tenderness than actual pain."*

Much stress is laid upon the pulse, by these gentlemen, in the form of the disease under consideration. They try to make it appear, that in common peritonitis it is always "frequent, small, and sharp," whereas in this disease it is fuller, but soon becomes feeble. Another short quotation from Dr Abercrombie's paper, will shew the absurdity of this distinction. "The pulse (says he) is frequently little affected, especially in the early stages. It may be from 80 to 90, or 96, but is sometimes scarcely above the natural standard."

Early tumefaction of the abdomen is supposed to be peculiar to puerperal peritonitis; but as no professional man, who has been in the habit of treating inflammation in the abdomen, whose opinion is of any value, will again hazard such an assertion, I shall pass it over without further notice, as also the pain in the forehead.

Lochial Discharge.—All the authors who have written upon this subject, including Mr Burns himself, state that the lochial discharge is variable,—that it sometimes flows as in ordinary cases, in some it is diminished, and in others suppressed. Dr James Hamilton jun. maintains that it never ceases in the true

* Edinburgh Medical and Surgical Journal, Vol. XVI.

puerperal fever; and that it is "*one striking mark of distinction between diseases which resemble each other in the prominent characters of fever and pain in the belly.*" Thus endeavouring to draw pathological distinctions from one symptom, confounding, as is his usual custom, cause and effect.

Diarrhœa sometimes occurs in the course of this disease, and is always to be regarded with anxiety. If the secretion of milk have taken place, it almost always recedes, and the breasts become flaccid; but the disease generally makes its attack before the secretion of milk commences, in which case it does not appear till two or three days after convalescence takes place.

Appearances on Dissection.—Dr Abercrombie's account of the appearances found in peritonitis, occurring in the ordinary state of the system, is as follows: "On dissection we find uniformly effusion of coagulable lymph, in some cases very extensive; and frequently effusion of a turbid or puriform fluid, sometimes in considerable quantity. Gangrene is rare, and as far as my observation extends, never occurs as the prominent appearance, it being, when it does occur, slight and partial, and always accompanied by extensive deposition of coagulable lymph."*

The following statement of the appearances found in the cases which were treated by Dr James Hamilton jun. in the Lying-in Hospital, was published in the inaugural dissertation of his pupil Dr Torrance, and acknowledged by Dr Hamilton to be correct.

"We found (says Dr Torrance) appearances similar to those observed by Hulme and Leake in the London hospitals. On examining the abdomen, fetid gas sometimes issued from it. A fluid was always found in the cavity of the peritoneum. When the effusion was in small quantity it resembled milk, and *joined the intestines together like glue;* but when in large quantity, it had the appearance of whey, and the adhesions were not so strong. We found small whitish portions of this matter in the folds of the intestines, which, when stirred, gave an appearance of milk to the effused fluid. The perito-

* Edinburgh Medical and Surgical Journal, Vol. XVI.

neal coat of the intestines had lost its usual pellucid appearance, felt hard, and ramifications of red vessels were conspicuous. These traces of inflammation, however, were not such as they should have been merely from an effusion of fluid into the abdomen. The peritoneal coat of the stomach seemed always sound. The muscular and cellular coats of the intestines were sometimes affected by an effusion between them. The villous coat was almost always natural. About four or five pounds of a fluid resembling coffee, was found in one or other of those affected.

"The omentum in some cases firmly adhered to the intestines, and its substance was so much affected, that it was torn in many places before it could be separated from them; but it never seemed mortified, nor was it dissolved into a purulent matter, as Leake and Hulme say they have seen it. The internal surface of the uterus was sound, and never affected with inflammation. Suppuration of the ovaria was sometimes manifest. In two or three cases, it seemed that the pleura had been involved in the inflammation, viz. by effusion, and other signs sufficiently marked."

Pathological Remarks.—1*st*, The peritoneum is the tissue affected by inflammation in this disease, which extends itself throughout the whole extent of the membrane, without attacking one portion more than another, except that part of the peritoneum which forms the broad ligaments, in which situation, it is probable, the disease first commences. Nevertheless the inflammation does not always appear to be general, the traces of its existence being sometimes confined to particular spots.

2*d*, The effused fluid found in the abdomen of women who have died of peritonitis, has nothing peculiar in it; it resembles a similar effusion found in peritonitis in men, and in the thorax of those who die of pleuritis. It varies in consistence and colour in all these cases, but it is generally a white or reddish serous fluid, containing flakes of albumen, more or less abundant, according to the intensity of the disease; and sometimes it has a puriform appearance.

3*d*, The substance of the uterus has rarely been found diseased, in this country at least, in any other degree than

being sometimes large, flabby, and tender. But we have accounts of fatal epidemics on the continent, more particularly of one which occurred in Paris in 1829, in which not only the uterus, but the venous and lymphatic systems, suffered much.*

4th, If a patient die in the early stage of peritonitis, we may find little vascularity, particularly if much blood have been drawn, although we are certain, from the previous symptoms, that inflammation had existed. If the patient survive longer, however, then we shall see the sero-purulent effusion. If the patient live still longer, the quantity of effusion is increased, and masses of coagulable lymph will be found glueing the intestines very slightly together. If the patient live still longer, the intestines will be matted together, and false membrane will sometimes be found covering the liver, spleen, and uterus, and the peritoneum itself will then be seen very vascular, and much thickened.

5th, The pleura is frequently found inflamed in this disease, as indicated by a similar sero-purulent effusion; and there is sometimes evidence of inflammation in the brain.

6th, This disease is more rapid in its course, and fatal in its termination, than ordinary peritonitis, from the peculiar condition in which a woman is left after parturition. In the *first* place, there has been an increasing determination of blood towards the uterine region during the previous nine months; and in the *second* place, an increase of nervous irritability. So that the balance of the circulation is left at this period in a very disordered condition, being readily upset upon the application of any of the usual causes; and when upset, the blood naturally takes its course towards the abdomen.

These are at least some of the reasons for the venous congestion which takes place in many cases, in a greater or less degree, particularly in women who have been worn out by breeding, or who have been debilitated by previous disease, or insufficient food and clothing. In these cases, the heart and other vital organs are so much oppressed, that they cannot create re-action, or the system is too weak to do so. In

* Vide Archives Genérales for March and April 1830. The Author has been induced to give a sketch of these forms of (what may be called) Puerperal Fever, at page 283.

one set of cases, speedy death takes place, the patient sinking without any marks of local disease, unless it can be said to be indicated by vomiting and diarrhœa, with some confusion of intellect. In another set, although considerable congestion has taken place, it is not to such an extent as to destroy the patient; inflammation attacks the peritoneum under a suppressed re-action, and it goes on with a surface which is almost bloodless; therefore there is little or no heat of skin; the pulse is small and weak; the expression of the countenance ghastly; and the pain in the abdomen perhaps sub-acute. There are various shades and degrees of this complaint, according to the various combinations of these two conditions of the system.

There are three other causes which enable us to account for the rapid march and fatal termination of puerperal peritonitis. The *first* which I shall mention is the occurrence of inflammation of that part of the peritoneum which covers the stomach, giving rise to those most violent symptoms which are described by authors under the title of Gastritis. In a majority of the fatal cases which have fallen under my notice, the peritoneum covering the stomach was highly inflamed; in several cases the whole stomach was in a softened state; and in all these cases there were most violent gastric symptoms. In the *second* place, inflammation of the peritoneum frequently takes place before delivery; sometimes as the original disease, and occasionally from the extension of inflammation and ulceration from the mucous membrane of the intestines. The natural pains conceal the disease during parturition; afterwards the pain from inflammation is mistaken for after-pains; and before alarm is taken, the patient is generally lost. Many examples of this have fallen under my notice since the publication of my Treatise on Puerperal Fever, and I think I am now able to anticipate what is likely to follow delivery. I have lost only one patient out of between sixty and seventy who had the disease. In the *third* place, something may be fairly attributed to the nature of the prevailing epidemic.

Treatment of Puerperal Peritonitis.—The only difference which exists between the treatment of peritonitis in the ordinary condition of the system, and that which is now under

consideration, proceeds from the two following circumstances: We have a more severe and extensive inflammation to subdue, which is more frequently combined with venous congestion, which suppresses the inflammation, and deceives the practitioner. If peritonitis attack a woman during the first two or three days after delivery, and is neglected for twelve hours, nay, in many instances, for six, any means we can employ will, in all probability, be unavailing. It is for this reason that I would rather treat the disease in an hospital than in any other situation. A physician, in such circumstances, requires almost to live with his patient, at least he should not be away from her bed-side for more than two hours at a time; nor will this be a great hardship, should he even have five or six such patients on his hands at a time,—the battle is to be won or lost in the course of twenty-four hours: but should it be sixty, a medical man must be always prepared to sacrifice his interest, and to disregard bodily fatigue, when the life of a fellow creature is at stake. If he will rest upon a bed of roses, scarcely a patient affected with this disease will be saved; and if Dr Hamilton visited his poor patients in the Lying-in Hospital only twice a-day, it so far enables the profession to account for Dr Torrance's conclusion with regard to the practice pursued. "Copious bleeding therefore, however much praised by Gordon, Armstrong, and Hey, in private practice, has always, on this recent occasion, deceived the hopes of the physicians of the Lying-in Hospital of Edinburgh, and has been from necessity laid aside." Dr Torrance says enough in one paragraph to shew the profession the puny manner in which the bleedings were executed,—that they were adopted "*without any alleviation of the symptoms;*" and the reader will be astonished when he is told the reason why Dr Hamilton appears to have under-bled, particularly after perusing the above sketch of the appearances found on dissection. He conceives that the effusion of coagulable lymph, and the consequent glueing together of the bowels, are produced by the bleeding; but he shall speak for himself. "It appeared to me, (says he,) that the effusion into the abdomen was accelerated by the bleeding."

Upon further experience, I can speak with much confidence

of the advantage of applying leeches. Many cases could be quoted, where one hundred, one hundred and fifty, two hundred, and two in which two hundred and forty were applied, first and last. They were very unpromising cases, but the ladies are now in the enjoyment of perfect health and strength. Leeches are to be applied in numbers according to the age and constitution of the patient, and the period of the disease; but it must be mentioned, that some constitutions cannot bear their application. Whenever we are in doubt, therefore, it is better to apply fewer than we would otherwise do, and repeat them according to circumstances. An ordinary constitution can well bear the bleeding from two dozen, and plethoric individuals from 50 to 100 at one application. When it is time to check the oozing of blood, we should see it done. In one case, a delicate lady who was labouring under peritonitis, twenty leeches were applied to the abdomen. Her husband was a medical man, and he ordered the nurse to stop the bleeding; she told him it had already stopped, and he went out on necessary business. On his return, he found his wife in the utmost state of exhaustion; upon examining her abdomen, he found only one orifice bleeding, but the blood was coming *per saltum*. One of the leeches had penetrated a small branch of an artery. Stimulants were necessary, and she recovered from the state of syncope. This case is mentioned here as a warning to young practitioners.

In the congestive cases, bleeding is to be had recourse to if called early, and if the pulse still possess sufficient strength. Stimulants may be necessary at the same time, and I have already shewn that stimulating and bleeding in such cases are not inconsistent with good pathology. The warm bath, stimulating frictions, and also large blisters, are to be applied; and subsequently calomel and opium may be used, together with the application of leeches. Considerable suffering, and many relapses, depend on a tympanitic state of the bowels. By percussion this state is discovered, and the best remedy is an enema, composed either of oil of turpentine or assafetida.

It is scarcely possible to give sufficiently precise directions regarding the circumstances which indicate the necessity for stimulants. Suffice it to say, that an experienced person de-

rives the necessary information from the heat of the surface, condition of the pulse, and the expression of the countenance. If the surface be cold, or even cool, particularly if there be a cold clammy sweat; if the pulse be weak, irritable, or irregular and weak, and if the expression of the countenance be ghastly, no one could entertain a doubt as to the propriety of exhibiting stimuli at the termination of any inflammatory disease.

Before concluding this subject, the proportion of deaths may be stated under each system, to enable the reader to draw his own conclusions.

The celebrated Dr William Hunter saved one patient only out of thirty-two; his practice became fixed, to give a good wine glass full of brandy at the commencement of the disease.

Dr Hulme, who considered the disease partly of a putrid nature, and who employed bleeding in small quantities, and only as a secondary remedy, lost almost every patient.

Dr Leake, who recommended bleeding in small quantities, and at long intervals, and who gave his patients bark, beef tea, and cordials, to prevent putridity, lost thirteen out of nineteen patients in one season.

Dr Gordon, when he adopted a weak, vacillating practice, lost twenty-three out of twenty-seven cases; but afterwards he used early and large bleedings, and out of fifty he lost only five.

Mr Hey of Leeds saved only three out of thirteen cases, before he began to bleed; but afterwards he was led, by sad experience, to bleed boldly and early, and he lost only two out of thirty-six patients.

Dr Armstrong, who seems to have profited early in life by the experience of others, assures us he only lost five out of forty-three.

On perusing this statement, the reader will perceive the dilemma in which Dr James Hamilton Jun. is placed, and will perhaps say in his own mind, that there is no hole through which he can escape; but alas! he does not know the ingenious Doctor; he will always escape, but always in a manner peculiar to himself. The reader will say, he cannot now assert that the cases of these authors could not be cases of puerperal

fever, because they had the lochia suppressed. It is indeed to be hoped he is not now guilty of such a blunder. What will the reader say, then, if Dr James Hamilton Jun. were to try to escape from the dilemma, by such an extravagant statement as the following? Suppose he were to say, *he held his fatal cases, in which bleeding failed in curing the disease, to be more certain proofs of the inefficacy of bleeding, than the production of forty-five cases where the patients recovered when bleeding had been used; for the cases might not be of puerperal fever at all, as had really happened in those cases cited by Drs Gordon and Armstrong, and Mr Hey of Leeds, where theirs terminated favourably under the lancet; or if they were really cases of the disease, he maintains that not the bleeding, but a natural change in the constitution, going on before that remedy had been employed, had effected the cure.* HIS FATAL CASES AFFORD POSITIVE PROOF; THE FORTY-FIVE FAVOURABLE CASES AFFORD ONLY NEGATIVE. The reader may here say, it is impossible that even a Professor in the University of Edinburgh, low as she has fallen in some of her medical chairs, could make such a statement. My answer to this is, that I shall be glad to be afforded an opportunity, upon Dr Hamilton's authority, of denying that he could ever have committed such an outrage upon common sense. This statement and offer were made in my first edition, entitled "Heads of Lectures," in 1828, and repeated in each subsequent edition.

In Dr Abercrombie's work on the Bowels, p. 189, the following passage will be found:—"I have little doubt that women in the puerperal state are liable *to two distinct forms of peritonitis, which, in the discussions on this subject, have probably not been sufficiently distinguished from each other.*" Then, the only conclusion which can be drawn is, that the author never perused the works to which he makes such a faint allusion. The two distinct forms, answering precisely to the description by Dr Abercrombie, were most emphatically pointed out by the late Dr Armstrong, and more recently by myself. I could give a true explanation of Dr Abercrombie's speculation were it necessary; in the meantime I shall leave him to enjoy the reward due to his discovery!! *

* I do not think it necessary to notice formally, the analogy which Dr Aber-

*Another and fatal variety of disease sometimes takes place after delivery, which must be noticed in this section, although it is not always connected with Peritonitis.** The fatal variety consists of hysteritis, or inflammation of the uterus, uterine phlebitis, and inflammation of the absorbent vessels of the uterus. Following the order which Dr Lee has adopted, I shall treat, 1*st*, Of inflammation of the substance of the uterus. 2*d*, Inflammation of the absorbent vessels of the uterus. 3*d*, Inflammation of the veins of the uterus.

1*st*, *Inflammation of the uterus.*—Symptoms, hypogastric pain; diminution or suppression of the lochia rigors; rapid, feeble pulse; countenance pallid, expressing anxiety and distress; cerebral disturbance, viz. headache and delirium; skin hot and dry, frequently sallow; respiration hurried; great prostration of strength; tongue loaded and foul; dark sordes about the mouth. Nausea and vomiting are occasionally experienced. The course of the disease is sometimes fearfully rapid, at others it is not fatal till towards the end of the second week. It is stated that the diagnosis "is extremely difficult." I have frequently seen cases of peritonitis, in the puerperal state, with equally distressing symptoms and speedy death, in which the most careful examination after death proved every part of the uterus to be sound, but its peritoneal coat.

At page 276. of the former edition, the severe epidemics that had occurred on the Continent, more particularly that at Paris in 1829, were briefly noticed. During the epidemic at Paris, there were forty-nine out of two hundred and twenty-

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crombie has endeavoured to form between puerperal fever, when it is severe and fatal, with erysipelas, because he does not bring a shadow of proof in its support. It is most improbable that serous membranes are liable to erysipelas; so say Bayle, Gasc, and all the most esteemed pathological inquirers of the present day.

* I have met with one case only of this disease, and therefore feel that I am not qualified, either to give an opinion, or to write on the subject. I shall therefore take the liberty of giving a brief abstract from Dr Robert Lee's paper on puerperal fever, in the 8th and 9th Parts of the Cyclopædia of Practical Medicine. The profession is much indebted to this zealous and talented pathologist, for his investigations on this subject, as well as for his following out the important discovery of the pathology of phlegmasia dolens by Professor Davis.

two fatal cases, in which the uterus was more or less disorganized.

As to the treatment, Dr Lee states, that "in all the cases of this affection which we have observed, the resources of nature and of art have proved equally unavailing in averting its fatal course."

Extract from the Report of the Dissections of Women who died in Child-bed in the General Hospital of Vienna, from 26th July to the end of August 1819, *by Dr Biermayer. Extracted from the Edinburgh Medical and Surgical Journal for July* 1824. *Vide No.* 80. *page* 83.

Fifty-six bodies were examined.—"In the head the organs were all turgid with blood; the ventricles generally contained more than the usual quantity of serum; in other respects there was nothing worthy of notice in reference to this disease.

"In the trachea there was generally found a sanguineous fluid, and its *internal surface* was *reddened.*

"The lungs were always in the greatest state of expansion, turgid with blood, frequently adhering or united by effused lymph to the pleura, which was generally, but not in all, slightly red.

"In the cavity of the thorax and pericardium, there was invariably more than the usual quantity of bloody serum; the pericardium in no case morbidly changed, nor the heart externally; but its substance, without exception, more flaccid and tender than in the healthy state. Its internal surface, particularly the valves, chiefly of the right side, of a deep red, often of a black colour; the mass of blood generally fluid.

"In the abdomen there were only two cases in which there was no unnatural fluid, *i. e.* in those cases which had been delivered a considerable time before death. In all the rest, there was found from one to two quarts of turbid, very fetid fluid, mixed with portions of coagulated lymph, and sometimes purulent matter; the latter appearance was observed in those cases where powerful antiphlogistic means had been employed, and who had survived longer after delivery.

"The peritoneum, omentum, and mesentery, exhibited, in

five cases only, no appearance of redness; in the rest it was always somewhat more or less red, particularly towards the pelvis; and they were often agglutinated with the adjacent parts.

" With the exception of two cases, the stomach and intestines were always much distended with air, and their external surface more or less red. Lumbrici frequently appeared in great numbers, not only in the small but also in the large intestines, in the stomach, rectum, and in one case, in the nostrils.

" The liver and spleen were always similarly affected, they were much more pale, flabby, and tender, than in their healthy state; easily broken down with the finger, similar to the degeneration of the uterus, and filled with somewhat fluid blood; * * * * * * the gall bladder was always filled with dark bile. The pancreas always healthy.

" The kidneys, in most of the cases, were flabby and tender. The uterus always somewhat enlarged and red. The urinary bladder always contracted.

" The internal organs of generation were everywhere covered with yellow coagulated lymph, except in two cases, in which no fluid was found in the abdomen; and in those cases in which strong antiphlogistic means were used, there was frequently a thick, yellow, purulent fluid, often externally on the neck of the womb. The ovaria and Fallopian tubes were always more or less swollen, red and tender.

" The uterus, in all cases little contracted, was more or less red externally, even in those where delivery had taken place long before, and the abdomen was not otherwise in an unhealthy condition. The substance or body of the uterus was always flabby, tender, easily broken down by the finger; in two cases, full of small holes or cavities filled with stinking blood. In two cases, the uterus, on account of the tenderness of its substance, had burst, during delivery, at its neck: in the one case, the rupture was four inches in length, and in the other, one inch and a half. The cavity of the uterus was found filled with fetid air several times, particularly in two syphilitic women. Its internal surface appeared generally covered with offensive cineritious ichor or mucus only, seldom

with offensive viscid blood. Beneath this, it was always red, discoloured, often as if slightly eroded or ulcerated, the internal membrane very much eroded and destroyed." * * * *

Such are the principal facts carefully abstracted from the whole 56 dissections.

We are further told in this Report, that the symptoms were such that the "*inflammation of the uterus and peritoneum, combined with high fever, could not be mistaken.*" The lochia disappeared either immediately, or in a few hours; and the mammæ were found empty of milk, loose, and flabby. "But, (says the Report,) the most alarming circumstance was, that while the disease was yet in all appearances a recent acute inflammation, Dr Boer, on examination with the finger, already discovered, in the mouth of the uterus, marks of gangrenous disorganization, which were rendered evident even to the bystanders, by the putrid smell of the finger."

2*d*, *Inflammation of the Uterine Absorbents.*—Dr Lee has given the particulars of four fatal cases of inflamed uterine absorbents, in his paper on Uterine Inflammation in Puerperal Women, in 15th Vol. Med. Chir. Trans. of London; and he has quoted a case, which appears to have been the first, in which the absorbents of the uterus were filled with pus.

With respect to the symptoms there is much obscurity. "The local symptoms (says Dr Lee,) of this affection are often so obscure as to escape detection during life; while the constitutional symptoms, which often resemble in a striking manner the effect produced by the introduction of specific poison into the body, are so violent as to yield to no remedies, however early and vigorously employed."

3*d*, *Inflammation of the veins of the Uterus.*—It would appear that a large proportion of these cases termed "low childbed fever," or typhoid "puerperal fever," are connected with this morbid lesion. Dr Lee states, that since the year 1827, twenty-four examples of this most insidious and fatal disease have fallen under his observation. He has given the following description of the phenomena. "In women who have enjoyed good health during pregnancy, and in whom the process of parturition has been easily accomplished, uterine phlebitis occasionally commences within twenty-four hours

after delivery, with pain, more or less acute, in the region of the uterus, accompanied or followed by a severe rigor, or a succession of rigors, a suppression of the lochial discharge, acceleration of the pulse, cephalalgia, or slight incoherence of intellect, with most distressing sensation of general uneasiness, and sometimes by nausea and vomiting. These symptoms, after a short duration, are succeeded by increased heat of the body, tremors of the muscles of the face and extremities, rapid, feeble pulse, anxious and hurried respiration, great thirst, with brown dry tongue, and frequent vomiting of green coloured matters. The sensorial functions usually become most affected, and there is a state of drowsy stupor, or violent delirium and agitation, which is followed by symptoms of extreme exhaustion; the whole surface of the body not unfrequently assumes a deep and peculiar sallow, or yellow colour; the abdomen sometimes becomes swollen and tympanitic, and some of the remote organs of the body, such as the lungs, heart, brain, liver, and spleen, or the articulations and cellular membranes of the extremities, suffer disorganization from congestion, or a rapid and destructive inflammation." Dr Lee adds, "there is scarcely an organ of the body, which has not been observed to become secondarily affected, from suppuration of the uterine veins." Occasionally, uterine phlebitis "commences at a later period after delivery than above described, and in a much more obscure and insidious form, without pain or sense of uneasiness in the region of the uterus, or any other local symptom by which the affection can be recognized. The uterus may return to the reduced volume it usually assumes after delivery; the lochial discharge may continue, and the inflammation and suppuration of the veins, which have caused the whole of the violent constitutional disturbance and destructive lesions in distant parts of the body, may have been wholly overlooked during life. In many cases which we have witnessed, this error was committed by the medical attendant, and stimulants were liberally administered, to obviate the debility supposed to exist in a specific form, without any local affections of the uterine organs." The effects of inflammation in the uterine veins are, "the formation of adventitious membrane on their inner surface, and the

deposition of coagula of lymph, or of purulent matter within their cavities." "The inflammation may be limited to the veins, but not unfrequently the muscular tissue contiguous to them, participates in the inflammation, and becomes of a dark red or blackish colour, and of an unusually soft consistence. The peritoneal covering may also be affected, and the usual consequences of puerperal peritonitis then ensue."

The subject is one of immense importance, and I trust, therefore, to be excused for quoting the following additional interesting passages, respecting the peculiar state of the veins. "The veins (says Dr Lee) which return the blood from the uterus and its appendages, may be either wholly or in part inflamed; generally, however, (and this is a circumstance in the history of uterine phlebitis, deserving particular attention,) the inflammation attacks the spermatic veins alone, and for the most part, the one only on that side of the uterus to which the placenta has been attached; and it may either confine itself to a small portion of the vessel, or extend throughout its whole course, from the uterus to the vena cava." "The same is the case with regard to the hypogastric veins, one only being generally affected. These are, however, more rarely affected than the spermatic veins; and this would seem to depend on the latter veins being invariably employed to return the blood from that part of the uterus, to which the placenta had been attached.

"But the inflammation having once begun, it is liable to spread continuously to the veins of the whole uterine system, to those of the ovaria, of the Fallopian tubes, and broad ligaments. The vena cava itself, does not always escape the inflammation spreading to it from the iliac, or from the spermatic veins. This seldom takes place to a great extent through the medium of the spermatic, the inflammation usually terminating abruptly at the opening of the spermatic into the cava on the right side, or of the renal on the left, &c. &c.

"When the inflammation affects the hypogastric veins, it may extend from these to the iliac and femoral veins, and thus give rise to all the phenomena of phlegmasia dolens."

Causes of Uterine Inflammation.—All the forms now noticed may be owing to mechanical injury from some

pressure which the uterus sustains in a protracted labour, in which the child is very large, or the pelvis rather small. They may also be produced by rashness in extracting the placenta, when the hand is introduced for that purpose into the cavity of the uterus, more particularly, perhaps, in cases of indurating of the placenta. It is said that uterine phlebitis may follow the retention of portions of the placenta undergoing decomposition in the uterus. Dr Lee allows, that although a dangerous disease, uterine phlebitis is not invariably fatal; and that "it often occurs in puerperal women, where it is not suspected," he thinks, is demonstrated by the fact, that in the spermatic and hypogastric veins of females advanced in life, calcareous concretions, and various kinds of disorganization, have frequently been observed, which must have been the consequence of attacks of acute inflammation at some remote period.

I may remark in reference to the last paragraph, that the term "phlebolites," has been applied to those bodies found in the spermatic and hypogastric veins; and that the attention of the profession has been called to this subject by Beclard, in his Anatomie Générale, and by Cloquet, in his Pathologie Chirurgicale. It has been ably followed up by Dr John Reid, an accomplished anatomist of this city, the result of whose labours on this subject will appear in the Edinburgh Medical and Surgical Journal, before this edition can possibly be published.

With regard to the treatment of these three severe varieties of uterine inflammation, I cannot speak from my own knowledge, and therefore am induced to borrow still further from Dr Lee. He states, that "in cases where the reaction at the invasion of the disease has been violent, and V. S. has been employed, the relief obtained has only been temporary, if at all experienced, and in some instances, the abstraction of only a few ounces of blood from the arm, has produced alarming syncope. When the local pain is severe, leeches and warm fomentations seem to be the appropriate remedies; but as far as our observations go, we are in possession of no remedial means which effectually controul these varieties of inflammation of the deeper seated structures of the uterus, which

we have attempted to describe." The French practitioners place great reliance on the action of mercury pushed quickly to salivation. Dr Lee states, that he gave this practice a fair trial, and that it failed, although he pushed it to great extent, and brought the system under the influence of mercury in less than twenty-four hours; "*Yet the progress of the symptoms was not arrested, and the patients died, as others had done where the remedy had not been administered.*"

CHRONIC PERITONITIS.

This form of disease sometimes succeeds to acute action in the tissue itself; sometimes it is occasioned by the extension of ulceration from the mucous coat of the bowels; and occasionally it is itself the primary disease, in which case the attack is often very insidious.

Symptoms.—Pains are occasionally felt in various parts of the abdomen, with a sense of weight or oppression; the pains come on in paroxysms, which are sometimes very severe, at other times a pricking sensation only is felt. In some cases pain is not a prominent symptom; the belly is tumid, with occasional tightness, while the rest of the body emaciates, and the strength declines slowly; fever is often present, that is to say, the pulse is quick, of variable strength and fulness, with thirst and restlessness. The tongue is in various states, either loaded, or very red, or both; constipation is a usual attendant for some time, but subsequently diarrhœa generally takes place; the stools often have a very natural appearance. The patient in all cases also experiences a sense of increased weight and uneasiness in the abdomen after a meal.

Chronic peritonitis runs its course to a fatal termination in various periods; I have known it of eighteen months standing, and sometimes the patient is destroyed in a few weeks. In the last stage the symptoms become aggravated; the features shrink; emaciation takes place to the greatest possible extent, and sometimes death appears to be owing to the patient's being worn out, or from an attack of constipation having all the symptoms of ileus, or from the supervention of acute in-

flammation, perhaps in the cavity of the thorax; all of which terminations I have seen.

It is in general a fatal disease, but I have seen some wonderful recoveries, if one may be allowed to judge from the appearances of thickening of the peritoneum, and extensive adhesions in the bodies of individuals who had survived the attack for a number of years, enjoying a tolerable share of health, and dying at last from the effects of other diseases. I lately attended a child who was observed to fall off in health and strength, and to complain occasionally of abdominal pain; he was feverish at night, but during the day was able to play about with the other children of the family; his body emaciated, while the abdomen became larger. Suddenly a decided change for the worse took place. The abdomen became more distended and painful, the fever increased, and he was confined to bed. In a few days a fulness was observed in the umbilical region, and an inflammatory blush. A natural opening soon took place, and a bilious-looking matter was discharged, with portions of food, such as barley, &c. When the discharge ceased, the symptoms became aggravated. He lived for some months. On examining the abdomen after death, there was an appearance of an abscess extending for several inches around the umbilicus, and immediately in contact with the intestines, round the circumference of which there were strong adhesions. In this cavity there was matter similar to that discharged through the external opening. On looking attentively at the parts, there were found nine openings into different parts of the intestinal tube. Some of these were large, others small; the orifices were ragged, and appeared to be the effect of ulceration, which opinion was amply confirmed by a minute examination of various portions of the mucous membrane, in which ulcerations in various stages were observed. The contents of the abdomen were all matted together, and the mesenteric glands were enlarged, and the mesentery thickened.

Chronic peritonitis is sometimes mistaken for other diseases, chiefly for dropsy, dyspepsia, and hepatitis.

Causes.—It has been already stated, that this disease sometimes follows an acute attack, and as the consequence of it. It is also produced by the extension of ulceration from the

mucous coat of the bowels; hence it sometimes occurs as one of the sequelæ of fever, diarrhœa, and dysentery. It is occasionally caused by external violence. It may also be produced among the children of the poor by insufficient clothing, the use of unwholesome food, as well as by the continual irritation from worms. In women it sometimes occurs at that period of life when the menstrual discharge ceases. It is probable that chronic peritonitis is often the consequence of irritation, produced by dysmenorrhœa, tumours growing from different parts of the uterine system, and by extra-uterine pregnancies.

Appearances on Dissection.—The whole intestines are sometimes agglutinated into one solid mass, involving the liver, spleen, and other parts; generally, however, we find the intestines and omentum only in that condition. Occasionally it is seen to affect the liver and parts in its neighbourhood, which are covered with a false membrane that can be readily peeled off, leaving the peritoneal coat attached to the organ. The disease may be confined to the contents of the pelvis, as is sometimes seen in scirrhous affections of the rectum and uterus, and diseases of the ovaria. It appears to me, from the repeated examination of extensive adhesions of the pelvic contents, in connexion with a small and circular os uteri, that chronic inflammation of the peritoneum may hereafter be found to be produced by the constant suffering, and consequent state of irritation, during the course of dysmenorrhœa. Occasionally the peritoneum is thickened every where without adhesions, but this is more frequently observed when there is an effusion of a serous fluid into the cavity of the abdomen, and particularly if it exist in any quantity. Sometimes the effusion is puriform. The colour of the peritoneum varies exceedingly; it is sometimes almost as red as if painted with vermillion, with large red vessels ramifying in different directions; sometimes the redness is confined to particular spots, as if produced by ecchymosis, in other places it is yellow, blue, purple, slate-coloured, black; but perhaps some of the discolouration may be owing to *post-mortem* changes. In some rare instances, the peritoneum appears smooth; in general it is rough from irregular elevations; ragged, which last appearance is sometimes, though rarely, produced by ulceration; most fre-

quently it is occasioned by the rough state of the membrane itself, and by very fine long irregular bands forming adhesions. On some occasions, the peritoneum presents partial fungosities, slightly elevated, extending in patches of irregular shapes, and of a red colour, looking very much like a coagulated bloody effusion. Chronic inflammatory action in the peritoneal coat, is a frequent cause of tubercular formation. I have seen tubercles in the peritoneum lining the general cavity, covering the intestines, stomach, liver, and spleen; also in the peritoneum which forms the omentum, mesentery, and mesocolon. Sometimes the mesenteric glands are also affected, but I have never seen them so without finding the corresponding parts of the mucous membrane of the intestine inflamed, more generally extensively ulcerated; so that I apprehend the too sweeping term "*scrofula*," has been applied to these formations upon limited or erroneous pathological views. The tuberculated state of the peritoneum generally takes place after the lungs have been attacked with the same disease; sometimes from chronic inflammation of the peritoneum, particularly when it succeeds to external violence. The tubercles on the peritoneum are sometimes of the miliary kind, occasionally crude, sometimes hard, and of various sizes up to that of an orange, occasionally resembling masses of coagulated blood; at other times having very much the character of the diseased structure termed medullary sarcoma, and they exist either singly or in groups hanging like bunches of fruit.

This description is drawn from cases and dissections which have fallen under my own observation; and my museum and portfolio contain preparations and representations of all the morbid appearances above stated, which were capable of being so preserved.

Treatment.—The disease is frequently a hopeless one, before medical advice is sought; but if the case should be ever so hopeless, it is the duty of a physician to use his best exertions up to the very period of death, as remarkable recoveries have been known to take place; indeed, I have remarked, that in proportion as pathology has advanced, the old practice of "giving up" patients has declined. We can almost always mitigate the violence of the symptoms, and place

the patient in a comparatively comfortable situation, when there can be no hope either of curing the disease, or of prolonging life. The question of general bleeding can rarely be entertained, yet I have met with a few cases in which it was loudly called for, and was productive of benefit. The frequent application of leeches, whenever a patient complains of pain, is of great service, together with contra-irritation, produced either by stimulating embrocations, tartar emetic ointment, or common blisters. Hot applications to the abdomen may be useful, together with the frequent employment of the warm bath. Assiduous attention to the bowels, however, forms a most essential part of the treatment; this is to be done, not by strong purgatives, but by very gentle laxatives, united with hyosciamus, and large tepid unstimulating injections used regularly once, sometimes twice a-day. Opiates are sometimes serviceable, but their use is often contraindicated by constipation. The employment of drastic purgatives in these cases cannot be defended, and three cases might be stated within my own experience, in which they produced fatal attacks of acute peritonitis. It is almost unnecessary to add the importance of attention to diet, which should be nourishing, but bland and unstimulating, as well as easy of digestion. Ass' milk once or twice a-day, is therefore to be employed, but patients should avoid distending the stomach much, and taking any article which they know from experience will produce flatulency, as the violent paroxysms of pain, which have been mentioned in the description of the symptoms, may frequently be traced to the presence of flatus. The knowledge of this will therefore lead us, during such a paroxysm, to give a carminative, but a turpentine injection will answer better. Exercise should be avoided, if motion produce even the slightest uneasiness.

INFLAMMATION OF THE MUCOUS MEMBRANE OF THE STOMACH AND BOWELS.

Before treating of the different diseases depending upon morbid states of the mucous membrane of the stomach and bowels, it will be of advantage to the student, to give a sketch of the different changes produced by inflammation in that tissue.

It is a point of the first importance, to determine the natural condition of the mucous membrane, in order to enable us to ascertain the appearances produced by disease. It is admitted, I believe, by every one, that the mucous membrane of the stomach and bowels presents, in the most healthy state in which we see it after death, a whitish appearance, with a slight tint of rose colour; that although blood-vessels may be seen here and there, yet they are not observed arborescing in great numbers, nor do we see any discoloured patches, unless there has been some great impediment to the circulation, or a natural change towards decay. Indeed, it is to be apprehended that some of the tints described with so much minuteness and accuracy by French pathologists, may be attributed to this last cause. It is stated, that the stomach becomes more vascular, and of a redder colour, during the act of digestion, than at any other period; which appears to be very probable, and may account for the red appearance found in the bodies of criminals after execution.

On opening the stomach of an individual who has suddenly died from accident, or from some disease unconnected with the bowels, the mucous membrane will be found slightly coated with mucus, which is not difficult to remove; and if the body have been opened within two or three days after death, it will be found in numerous folds or rugæ, which seem to be produced by the contraction of the muscular coat of the organ, leaving the mucous membrane free, so that it forms itself into folds, which it is conceived have nothing to do with a diseased

condition of the inner membrane itself. In a healthy state, the mucous membrane is not easily abraded.

The part of the stomach which appears to be most liable to inflammation, is the splenic extremity. In considering the diseased appearances of the stomach and intestines, it will be best to do so under the following four heads; viz. *colour*, *vascularity*, *exudation*, *alterations of structure*.

1*st*, With respect to the colour, we have to determine whether or not it be owing to *post-mortem* changes; and we must also be careful to avoid the error into which Broussais and his disciples have sometimes fallen, of attributing every change of colour to inflammatory action. The reader is referred to Dr Yellowly's observations on the vascular appearances in the human stomach, which are frequently mistaken for inflammation in that organ;* and more particularly to the first and third cases, in which the whole intestinal canal was minutely injected with dark-coloured blood in individuals who suffered the last sentence of the law. In these cases, Dr Yellowly very properly supposes that the circulation is carried on in the capillaries for some time after death. The appearance of the vessels, the exudation, and the structure of the mucous membrane itself, will, however, generally inform us, whether the colour described in Dr Yellowly's paper is fortuitous, or owing to diseased action.

We must also be careful to distinguish whether the colour depends on infiltration of blood into the sub-mucous tissue, or on inflammation of the membrane itself. A section of the part will shew this at once; for on looking at the cut edges, we shall see the mucous membrane separated from the muscular coat by the infiltration; the former having its usual healthy appearance. But it must be recollected that inflammation and infiltration very frequently co-exist; and when we wish to decide whether the mucous membrane is discoloured, the suspected part must be extended upon the finger, and a scratch made with a scalpel through the mucous coat itself, which will give us an opportunity of ascertaining its vascularity and structure. The chief discolourations of the mucous membrane

* In the 4th vol. of the London Medico-Chirurgical Transactions.

resulting from disease, are, bright red, dark red approaching to purple, brown, slate-coloured, and black. Minute shades of these colours are not noticed, because they are unimportant; nor shall I mention a number of other discolourations which are seen on dissection, because they are very doubtful signs of disease. It must be confessed, after all, that we are very liable to be deceived about the colour, as it is the most frequent, and, I apprehend, the first *post-mortem* change which takes place.

2*d*, *Vascularity*. Our attention should, in the first place, be directed to ascertain whether the vascularity is arterial or venous; if the latter, large, dark-coloured veins will be observed ramifying under the mucous membrane, and there will be few minute, arborescent vessels containing red blood. In fact, we shall see the appearances which Dr Yellowly has so faithfully described in the two cases already quoted; in the first of which, "the whole of the abdominal viscera were loaded, as if by minute injection, with dark-coloured blood. *Here and there, however, there were florid vessels, which were distinctly traceable into dark-coloured ones.*" In the other, "the whole of the intestinal canal was minutely injected with blood, which was, for the most part, of a *dark crimson or purple, but here and there of a florid hue.*" If the vascularity be arterial, and connected with inflammatory action, we shall see red points, or numerous red vessels running in lines or patches, with or without ecchymosed spots in the mucous membrane. We shall observe them not in depending parts only, in which situation they are always doubtful signs of inflammation, unless accompanied by a corresponding exudation or alteration of structure. It is always necessary to make a section, first of the mucous membrane, and then of the other structures, to prove whether the vascularity exists in the mucous coat or in the other tissues, or in all of them; if in the former, a slight cut made through the mucous membrane will divide the vessels, a little blood will exude, and the parts beneath will have the natural white appearance; and, upon tearing away the mucous membrane with a pair of forceps, the white appearance of the subjacent parts will be still better seen. The vascularity is doubtful when there is disease of the heart, or any other cause which obstructs

the circulation. Even in that case, however, I imagine the vascularity must be regarded as a diseased appearance; and, particularly, when it is recollected, that it frequently terminates in inflammation, and even ulceration, as will be shewn hereafter, when treating of phthisis.

In estimating the extent of the vascularity, we ought to recollect that it must diminish very considerably after death, and particularly in recent inflammations. The tunica conjunctiva of an ophthalmic patient, loses its turgescence and redness at death, or soon after.

3*d*, *Exudation.* The first effect of inflammation on all secreting surfaces, is supposed to be a diminution of the natural secretion; but it is not certain whether this holds good in the mucous membrane of the stomach and bowels. In several instances it has presented a dry appearance, but these were cases of long standing chronic inflammation. The exudation merits our careful attention with regard to its tenacity, quantity, and colour. If it be viscid, and in considerable quantity, upon a surface which presents many red vessels, however partial the vascularity may be, it is to be regarded as the product of irritation or inflammation. It varies very much in colour, from that of ordinary mucus, to pus; and a red matter like currant jelly is frequently found; the exudation has been represented to be occasionally so corrosive as to excoriate the fingers of the dissectors; but it is probable there is some mistake about this statement. There can be no doubt, however, that the mucous membrane yields a large quantity of thick tenacious mucus, colourless like starch, when it is under the influence of any kind of irritation; this is well illustrated in the experiments performed with the tartrate of antimony in considerable doses, which were published by me in the 258th number of the Lancet. With respect to the red exudation, two kinds are observed; one, like very red currant jelly, which is produced when the membrane is under a high degree of inflammation; the other, of a much darker hue, darker even than venous blood, more fluid than the other, and occasionally discharged in very large quantity; this will in general be found in cases where there is great congestion of the mucous membrane, along with some degree of inflammation. A

similar discharge often takes place in diseases of the liver and spleen.

4*th*, *Alterations of Structure.* The first appearance which falls to be noticed, is the pulpiness, with thickening of the mucous membrane. When it is in this state, the surface, if closely examined, looks rough and granular, and the membrane can be easily rubbed off. Abrasions are sometimes seen, but not so frequently the result of acute inflammation as of chronic; at all events, they are not so extensive. This is an appearance, however, concerning which we are very liable to be deceived; for when the membrane is soft, abrasions are easily produced by handling. Those which are the consequences of disease, will be readily recognized by placing the part in water, a portion will be entirely awanting, the edges will look ragged, and the surrounding parts will be found detached. Ulcerations are now known to be a frequent result of acute inflammation; but there is some degree of ambiguity about the tissue primarily involved. Some allege that they exist in the glandular structure, others in the mucous follicles; while there are some who assert that the ulcerations take place in the mucous surface generally.

It is now well ascertained that some parts of the mucous membrane of the stomach and bowels are more liable to inflammation and ulceration than others. The inferior half of the ileum is the part most frequently found inflamed and ulcerated; according to my experience, the colon stands next to the ileum, and it is an extraordinary fact that the jejunum is seldom affected. Why it should possess this remarkable immunity from disease, has never been explained. In a case of poisoning from corrosive sublimate, the jejunum was in a healthy state, while the stomach, the lower part of the ileum, the colon and rectum, were affected most severely, even to the destruction of the mucous surface, and thickening of the other parts of the intestine, the peritoneal coat only remaining sound.

In proceeding to examine a piece of intestine, it should be carefully cut open with a blunt-pointed pair of scissors; and after the exudation is observed, the parts should be washed in water, till the mucus is removed from its surface. On some

occasions we shall see numerous dark-coloured, distinct points, somewhat elevated with a depression in the centre, which are the mucous follicles enlarged;* in some places a number of these points will be seen to coalesce, sometimes in a circular space, but in general they are more of an oblong shape. The surface is elevated, and sometimes spongy; and upon making a section through this part, it will in general be found that the sub-mucous tissue is principally involved in the disease, and occasionally also the muscular tunic. On looking at the surface through a glass, ulcerations will be discovered. This appearance is most frequently observed in the lower part of the ileum and caput cæcum, in children who have died of bowel complaints.

Occasionally numerous distinct points will be observed, as if a pen-full of red ink were spattered over the surface of the mucous membrane; this I imagine is occasioned by an exudation of blood in the follicles, which are thereby distended. It is also noticed by Billard, to whose work upon the diseased conditions of the mucous membrane the reader is referred for much useful information, as well as to the 1st and 2d vols. of Andral's Clinique.†

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* There is a preparation in my museum, showing the mucous follicles of the colon, so large that many of them would admit a swan-shot. The colon is contracted. The patient died after a surgical operation.

† Since the publication of the first edition, M. Andral has favoured the profession with a work on pathology, which cannot fail greatly to advance the interests of Medical Science. The work is divided into two parts—the first treats of general, the second of special pathological anatomy. There is perhaps no individual so well qualified to undertake such a laborious task as M. Andral. He is not only placed by universal consent at the head of the French Pathological School, but I believe, had the scientific medical men of Great Britain been polled, they would, with one voice, have confirmed the choice of his own countrymen. Few have had such extensive opportunities of examining the physical changes produced by diseased action; and I believe still fewer are to be found who could give such graphic descriptions. He has conducted himself with great fairness towards his pathological opponents; and those who have followed similar pursuits, will agree with me that his delineations bear the stamp of truth. A faithful translation of this excellent work has lately appeared, the joint production of Drs Townsend and West of Dublin. Those who are not familiar with the French language, may feel obliged to these gentlemen for putting such a work into their hands,—a work which, from the style in which it has been

On other occasions ulcerations are observed, of a circular or oval form, with defined margins, attended by loss of substance, not only of the mucous membrane and the sub-mucous tissue, but extending into the muscular coat, which may be seen in different places in a ragged state. In addition to this, the mucous membrane is sometimes excavated to a considerable extent. The ulceration often destroys the greater part of the muscular coat, so as to affect the peritoneum, which will then be found thickened and inflamed; the external surface being either covered with lymph, or looking like an excrescence of a dark red colour. Occasionally, when ulceration attacks the mucous coat, the sub-mucous tissue and the muscular coat become infiltrated with lymph, producing a thickening of the rest of the intestine, as if it were intended to strengthen the part, and prevent rupture. When ulceration first attacks the muscular coat, it would appear that an effusion of lymph takes place in the outer cellular tissue, in which case it is difficult to separate the peritoneum from the muscular coat at the diseased part. Occasionally, indeed, the ulceration extends through all the tissues, allowing the escape of the contents of the bowels into the abdomen. Sometimes we observe distinct ulcerations on the mucous surface, inclining to the circular form, which are considerably elevated above the surrounding parts, resembling carbuncles, and having an appearance as if they were to throw off a slough. Upon making a section of the intestine through the centre of one of these ulcerations, the cellular substance, and a part of the mucous coat, will be observed to be much thickened, and occasionally of a dark brown colour. Ulcerations are sometimes circular, at others oval; sometimes they run in lines, and on other occasions are observed to be irregular in shape. In

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brought out, will not, I fear, remunerate the translators. It is worth a thousand volumes produced by a literary compiler. It looks very suspicious to see a review highly commendatory of his own work in the journal of which Dr Craigie is editor, and another of as contrary a character of that of Andral. Had Andral been a British writer, I would have left him to fight his own battle with the reviewer; but being a foreigner, I think it desirable that the selfishness of one should not be thrown as a slur upon a whole nation.

size they vary from that of a millet-seed, to be so extensive as to occupy a larger space, sometimes the whole intestine. In general, ulcerations of the colon are more irregular in shape and size, than of any other part of the intestine. In some instances ulcerations are surrounded by indurated margins, in others the mucous membrane seems to be merely removed. Ulcerations in the small intestines are, for the most part, found in that portion of the tube most distant from the mesentery. In the colon they are sometimes seen to run in the course of the transverse bands, which are greatly thickened and indurated, while the mucous membrane may be partially or completely removed. Occasionally these ulcerations have a red appearance, or are tinged of a yellow or greenish colour by the feces or bile, and are surrounded by a great number of red vessels; but in other instances, they present a blanched appearance; which last will be principally observed in cases where there has been a great discharge by stool. In many instances, the part of the intestine which is already ulcerated will shew few or no red vessels, while other parts that are only advancing to that condition display intense arborescent vascularity.

Ulcerations produce contractions of the calibre of the whole tube; but this is rare, unless the whole mucous surface be involved in the disease. It is not exactly the ulceration which produces the contraction, but an effusion of lymph into the other coats and cellular tissues, causing considerable thickening. Occasionally we see the mucous membrane intensely red and thickened, partly from inflammation, and partly from infiltration; and in one or two places presenting a seared appearance, as if it had been touched by a red-hot iron; it looks somewhat puckered and very dark coloured, and sometimes the neighbouring part is slightly mottled, as if from white granulations; but this is a rare appearance, yet I have seen it on several occasions, and always in the stomach.

An œdematous condition of the sub-mucous tissue is occasionally the result of acute action in the mucous membrane; but it may be also found in cases of general or partial dropsy. When the mucous membrane is sound, the effusion is not to be regarded as the result of inflammation. An effu-

sion of air is also occasionally found in the sub-mucous tissue; but whether the result of inflammation, or a *post-mortem* change, was not satisfactorily determined till the appearance of cholera in Edinburgh. In several cholera cases, an extensive effusion of air was found in the sub-mucous tissue, when the dissections were performed a few hours after death,—too short a time to allow of such a *post-mortem* change. Mortification of the mucous membrane is also an occasional result of acute inflammation. This presents itself to us under two forms; the one is generally observed in the stomach in cases of fever, and in the last stage of phthisis, in which the mucous membrane is removed over a great extent of surface, leaving the parts of a dark colour; the other is observed in the intestine, and particularly about the cæcum and ascending colon, in which the mucous membrane is lying loose, and in shreds of a very dark colour, and having the most offensive gangrenous odour.

Inflammation of the mucous membrane, more particularly of the colon and rectum, terminates in a general thickening of the membrane and the sub-mucous tissue; and occasionally the muscular coat is also involved. The mucous surface is soft and spongy, sometimes partially abraded and very much thickened and discoloured; in some places of a bright red; in others, of a dark mulberry colour; no distinct vessels can be seen, and the discolouration seems to be partly owing to infiltration of blood. This appearance is very apt to be confounded with mortification, and is principally observed in the most acute form of tropical dysentery; but I have had many opportunities of seeing it in this country, in cases which ran their course in from eight to fourteen days. In some of these the intestine is more than the eighth of an inch in thickness,—the preparations are preserved in my Museum.

Sometimes the mucous membrane of the colon and rectum, together with the muscular coat and sub-mucous tissue, are seen simply in a state of hypertrophy, to a great extent, which appears to me to be the result of former inflammatory action; many of the subjects had been in warm countries, and had suffered from dysentery.

It is well known that ulcerations, with considerable loss of

substance, undergo the healing process; and that for some time afterwards, the parts so restored may be distinguished by an appearance of cicatrization, which pathologists are well acquainted with, and which is best observed in old cases of dysentery. A beautiful preparation, shewing these appearances, is in my Museum.

Sometimes we see tubercles in the mucous membrane itself, with more or less extensive ulceration; or the tubercles are found in the sub-mucous tissue, with ulcerations on the mucous surface, in various stages, and extending from the tubercular elevations. These appearances are also principally seen in the colon in cases of phthisis.

There are, no doubt, many other appearances which are produced by inflammatory action in the mucous membrane; but a minute description of all would require a separate treatise, and is not consistent with the plan of this work.

Competent judges may deem the above description very imperfect. I can only say it is drawn from nature, and it will afford me much pleasure to demonstrate its general correctness, by shewing the preparations and drawings in my collection from which it is taken.

INFLAMMATION OF THE MUCOUS MEMBRANE OF THE STOMACH.

It is difficult to determine the meaning of most writers when they speak of Gastritis. Some use this term to indicate inflammation of the peritoneal coat of the stomach, which is a rare disease; others, the mucous. A great deal of obscurity also prevails in different works, from the use of the terms phlegmonous and erysipelatous, adhesive and erythematic, which I shall therefore be careful to avoid.

By gastritis, I mean to express an inflammation of the mucous membrane of the stomach, frequently involving the sub-mucous tissue, and occasionally the muscular coat.

Inflammation of the mucous membrane of the stomach exists in various degrees of intensity, from the most acute to the slightest sub-acute form; and it may also be chronic. Acute inflammation of the mucous membrane of the stomach is a

rare disease; it often exists in a sub-acute, but more frequently in a chronic form.

Symptoms of Gastritis.—There is a burning pain in the region of the stomach, increased on pressure; a constant desire for cold drinks, which are immediately vomited; nausea, and inclination to retch, are incessant; the heat over the surface of the epigastric region is considerable, while the extremities are perhaps cold. At the same time the patient frequently complains of sore throat; and upon examination, the fauces will be found inflamed. Hiccup is a troublesome symptom. The state of the tongue cannot altogether be depended upon; in general, however, it is very red at the tip, and round the edges; loaded, and occasionally very rough in the centre, and towards the root; sometimes, in long standing chronic inflammation, it is red, glazed, and smooth; although I feel persuaded that this last condition of the tongue takes place more generally when the intestines are inflamed and ulcerated, than the stomach. The breathing is anxious and quick, and the patient restless; the pulse is small, and the prostration of strength soon becomes very great; the countenance is expressive of great anxiety, and the individual makes great complaint. Towards the termination of the disease, the features shrink, and the patient lies upon his back. The matter vomited in the early stages, consists of the fluids taken into the stomach, occasionally mixed with bile and some mucus; but at last the black vomit takes place. The bowels are generally constipated.

There is scarcely any acute disease which so quickly exhausts the powers of life, and hence it is said that the symptomatic fever is of a typhoid type. It happens occasionally, however, that the symptoms are exceedingly mild, even when the disease has been produced by mineral poisons; and appearances denoting great danger, do not come on till within a few hours of the fatal termination. This was particularly well marked in a soldier of the 17th foot, who swallowed two drachms of the oxymuriate of mercury, and who died unexpectedly eight or ten days afterwards on the close stool; having been able to get out of bed, and walk unsupported.

It has been already stated, that the acute form of this dis-

ease is a very rare occurrence, and that it more frequently exists in a sub-acute and chronic form; and we see these most frequently in fevers, in dyspepsia, and in the last stage of phthisis.

Causes.—This disease is produced by any of the common causes which occasion inflammation; by wounds and contusions, as well as by poisons and other acrid substances taken into the stomach, also too great indulgence in the use of ardent spirits: it sometimes follows in the train of other diseases, as cholera morbus, &c.

Appearances on Dissection.—On opening the stomach, a considerable quantity of thick, tenacious mucus will be observed; and the mucous membrane itself will be found in one or other of the conditions already noticed in the general description. It may be mentioned, that the appearances produced by poisons so closely resemble the lesions occasioned by ordinary inflammation, that no distinction can be made; and the nature of the case must rest upon the fact of poison being found, and its powers ascertained.

Treatment.—Bleeding copiously and frequently must be had recourse to, and at short intervals; there is no disease which requires a more decided use of the lancet. The application of leeches in considerable numbers may also be found necessary, either after the inflammation has been somewhat subdued by the lancet, or when the physician is afraid that it is too late for general bleeding. Blisters are, of course, to be employed in severe cases. Laxative medicines are also necessary; but it is needless to administer them till the diseased action is considerably subdued, as they will increase the already too irritable state of the stomach; therefore, in the first instance, we are to endeavour to open the bowels by injections. Opiates are very useful; but it is necessary to caution young practitioners against the routine practice which is too generally followed, of trusting to opium whenever there is irritability of the stomach. When opium is given, it is often advantageous to exhibit it in the form of pill combined with calomel. The warm bath, and hot fomentations to the part affected, are means which must not be neglected; and it is necessary to restore and support the natural heat of the extremities.

During convalescence, the diet must be carefully attended to, and should merely consist, for the first day or two, of arrow-root or fine oatmeal gruel.

INFLAMMATION OF THE MUCOUS MEMBRANE OF THE BOWELS.

INFLAMMATION of the mucous membrane of the bowels, varies perhaps more in its external signs than that of any other structure in the body, and for the most part its attack is most insidious. The disease is most frequently met with in a subacute and chronic form; even when acute, the symptoms are sometimes exceedingly mild; and this takes place occasionally in cases where we subsequently find, on dissection, not only the most extensive inflammations, but ulceration; which will be more fully shewn when treating of dysentery.

Symptoms.—The combination of symptoms denominated fever, take place with more or less intensity; in fact, as already shewn, inflammation of this tissue is the cause of many of the fevers which prevail in all climates. Pain is often very slightly felt, in comparison with that which generally attends peritonitis; when the small intestines are affected, the pain is experienced more about the umbilicus than in any other region; cold drinks aggravate it, as well as any indigestible substance taken into the stomach. The pulse is found in very different states even during the same day; it is frequently quick, but not in general so hard as in peritonitis. The skin is generally hot and parched during the day and night, but towards morning some degree of moisture takes place, and it is then only the patient enjoys comfortable sleep. Thirst is often very urgent.

Tympanitic distention causes considerable suffering to the patient, and aggravates the constitutional symptoms. The tongue is not altogether a sure index of the state of the mucous membrane, as I have seen it perfectly clean and natural in colour, or foul without redness, when dissection revealed most extensive inflammation. But in general, the tongue will be found to be more or less red at the tip, and round the edges, however much it may be loaded in the centre; sometimes it is altogether red, and looks raw, and perfectly smooth like

varnished leather; when it is unusually red, I look upon it as a certain indication of very considerable irritation, or of some degree of inflammation or ulceration of the mucous membrane of the bowels. When the superior parts of the tube are diseased, there is more or less nausea and tendency to vomit; when the inferior parts are implicated, we find pain in the iliac regions, and in the course of the colon, with more or less diarrhœa, and considerable discharges of flatus; and when the colon is severely affected, there is that twisting pain in the bowels, which in medical language is denominated "tormina;" it comes on in paroxysms, with intervals of perfect ease. The patient complains of it every hour, or half hour, and even at shorter intervals, and it is always followed by an irresistible desire to go to stool. When the rectum is involved, there is considerable straining, and the patient can scarcely be induced to leave the close-stool, and yet he passes nothing but a little mucus mixed with blood, or a small quantity of scybalous matter, with some flatus.

Every experienced medical man, upon reading these passages, will perceive that I have been describing the symptoms of diarrhœa and dysentery; but my wish at present is to describe inflammation of the mucous membrane of the intestines generally, as the peculiar nature of the discharges by stool, which constitute diarrhœa and dysentery, do not always attend inflammation of that membrane.

Women after delivery are sometimes seized with this affection; and some imagine, that when peritonitis takes place in that condition of the system, it is always owing to the extension of the inflammation from the mucous tissue. But although sometimes the case, this cannot be assented to as a general rule. An instance of pure inflammation of the mucous membrane of the small intestines lately occurred to a woman, after an abortion at the fourth month, which resisted the most active practice, and terminated fatally. On dissection, traces of active inflammation of the whole membrane were discovered, which several days maceration in water did not destroy; and a portion of it, which is put up in spirits in my Museum, still retains its red colour. There were also a great number of abrasions, which, had the woman lived a few days longer,

would have been converted into deep and extensive ulcerations. Another fatal case occurred in the practice of a friend, after delivery at the full period. In this lady, the disease was apparently produced by a large quantity of grapes she had eaten with the skins and stones, which were found in different parts of the intestinal canal. But in neither of these cases did the peritoneum suffer.

Treatment.—If the disease be very acute, the lancet must be used; but the cases which usually fall under our notice, will yield readily after the application of a dozen or eighteen leeches to the abdomen, together with the warm bath, fomentations, and the gentlest laxatives. If there be much tympanitic distention, injections with a small quantity of turpentine, or with an infusion of tobacco, will be found very serviceable. Opiates are useful, and the best preparation perhaps, in such circumstances, is Dover's powder. We shall seldom be obliged to apply blisters, except in very acute cases; but the disease is often mitigated by the application of hot oil of turpentine, or a mustard poultice, which is to be removed in a short time, so as not to occasion vesication. Attention must be paid to diet and clothing, particularly during convalescence.

Chronic Inflammation of the Mucous Membrane.—I have frequent occasion to see cases of long standing inflammation of this tissue. They will be often found connected with some cutaneous eruption, as lepra, psoriasis, &c. or with ulcers on the extremities. It will be observed, that the patients enjoy best health when the eruptions are most severe, or the ulcers most troublesome, and attended with copious discharge. These circumstances were first forced upon my attention, upwards of twenty-five years ago, in a warm climate, and subsequent observations have tended to confirm them.

These pathological considerations would seem to demand a different treatment from that generally pursued in diseases of the skin, as well as in many ulcers on the extremities, and will shew surgeons the propriety of attending to medical pathology, so as to enable them to treat even a common ulcer. I do not mean to assert that all ulcers are produced by this cause, but that many are so, I have no doubt; and it is necessary to

point out the circumstances which will enable a young practitioner to distinguish them. When a person affected with an ulcer says that he feels in better health when the ulcer is open than when it is healed, we may suspect that there is some internal disease; but when we likewise find his skin harsh, his thirst increased, the appetite impaired, or fastidious, together with some degree of nausea; if there be uneasiness, fulness and oppression in the abdomen, increased after taking a cold drink, or after meals; if he be alternately affected with constipation and diarrhœa, the evacuations being fetid and discoloured; if the tongue be loaded, and of a red colour at the tip and round the edges, or universally red, or loaded, but covered with large and elevated papillæ at the root: If any of these symptoms exist, even in a slight degree, along with the ulcer, or become increased after it is healed, we may rely upon it, that the mucous membrane of some part of the intestinal tube is affected.

Treatment.—In the cases I have described, whether attended by ulcerations or eruptions, I have sometimes seen the most striking benefit from general bleeding; but this is not often necessary, unless the eruption be attended with much inflammation of the skin. In general, leeches applied every second or third day about the umbilicus, and repeated for some time, together with the general warm bath, gentle laxatives, a bland dry diet, never allowing the patient to eat a large quantity at a meal, will be productive of great benefit. Subsequently contra-irritation, produced by the tartrate of antimony ointment, is to be used; but I shall speak more fully upon the subject, in the second volume, when treating of cutaneous diseases.

DIARRHŒA.

A person who has frequent liquid stools, is said to have a diarrhœa, which may exist with or without fever. The evacuations are almost always fetid, discoloured, watery, or somewhat slimy, containing more or less feculent matter. Sometimes, on examining a watery or a slimy stool, small, round, and hard masses of feces may be found. Diarrhœa may also be attended with thirst; griping pains in the belly,

which become relieved for a short time after an evacuation; and there is frequently tenesmus.

Pathology.—Diarrhœa is to be looked upon as a mere symptom instead of a disease, in which light it is too frequently regarded. The disease is some irritation or inflammation of the mucous membrane of the bowels, produced by fright, the application of cold, unwholesome, and indigestible food, diseased biliary secretion, constipation. These are the principal causes; so that we may have diarrhœa with and without inflammation. When there is inflammation, the constitutional symptoms are pretty well marked by rigors, heat of the surface, and state of the pulse.

Treatment.—From the short pathological description given above, it will be seen that the treatment must be considerably modified. If the affection be produced by the application of cold to the surface, the warm bath, a dose of Dover's powder, and subsequent attention to clothing, and particularly preserving the heat of the extremities, will be all that is required. If by unwholesome food, it must be avoided for the future; gentle laxatives must be given, to hurry the passage of the offending matter through the bowels, followed by an opiate. If by diseased biliary secretion, which is to be recognized by the existence of nausea, or even vomiting of considerable quantities of bile, together with the passage of bilious stools, which perhaps will produce a pungent sensation in the rectum, and considerable tenesmus,—a little calomel and opium may be prescribed, followed by small doses of Epsom, or any other salts, largely diluted with water, together with copious drinks of gruel, or barley water, or any other bland diluent. If from constipation, which can only be recognized by examining the stools, that state must be removed by gentle laxatives, frequently repeated, conjoined with opium or hyosciamus, and assisted by unstimulating injections. In this case, the warm bath is also serviceable; and after the bowels are fairly cleared of the hardened feces, the irritation is to be subdued by an opiate. If, in any of these cases, there should be considerable pain in the belly, with fever and a hard pulse, bleeding may do good, and can rarely do harm. But should diarrhœa depend on inflammation of the mucous membrane, or should

inflammation supervene during the progress of the disease, bleeding, either general or topical, ought to be employed, if the means above recommended do not succeed. Cases have occurred to me, where nothing else was necessary after abstracting blood from the arm, but which had previously resisted all the ordinary remedies for many days. If, notwithstanding the employment of these means, the patient be not relieved, or if he be so weak as to make us anxious to save blood, an injection of tobacco may be perhaps substituted. Opiates, attention to the diet, and contra-irritation, must be had recourse to. If in any case there be much tenesmus, a tea-spoonful of laudanum, mixed in an ounce or two of gruel, is to be thrown into the rectum.

It would appear that Hume, the celebrated historian, died from ulceration of the bowels, which was not recognized by his physicians.*

BOWEL COMPLAINTS OF CHILDREN.

The pathological observations already made in the last sections equally apply to the bowel complaints of children. In the course of practice, it is distressing to see so many children carried to the grave from a diseased condition of the alimentary canal; although there is no class of complaints, which, when taken early, and treated according to good pathological principles, are more under controul. They frequently terminate by producing marasmus, and a complaint which I have presently to notice, under the name of *Tabes Mesenterica*.

Much mischief is occasioned by the method too generally adopted immediately after birth. A child is scarcely dressed, when a tea-spoonful of castor oil is wantonly forced down the throat; or a great deal of sugar and water is given, for the unnecessary purpose of purging away the dark matter which collects in the large intestines during the last two or three months of its uterine life. We ought to be in no hurry to expel this matter, as if it were a virulent poison, the re-

* The account of his symptoms and feelings, in his own words, is very interesting.—Vide History of England, vol. i. Introduction, p. xix.

tention of which will carry death into the very vitals. We frequently see fatal bowel complaints produced by this cause, and it is no uncommon thing to discover that drastic purgatives have been employed. Not long ago, I was called to see a child under a fortnight old, who was taking half a grain of calomel and two grains of scammony twice a-day, although it had from fifteen to twenty stools during the course of twenty-four hours, notwithstanding the exhibition of occasional doses of chalk mixture. In such cases, the drastic purgatives are given in the first instance to "clear out the bowels," and afterwards persevered in "*to improve the evacuations.*"

Another source of the bowel complaints of children, proceeds from the absurdities constantly committed with respect to their food. Soon after the castor has been exhibited, the nurse insists upon giving food, consisting of thick gruel, which the stomach is totally incapable of digesting; flatulency is the consequence; they cry; and then the nurse flies to Dalby's carminative for relief, which produces ease for a time, but by inducing constipation, renders another dose of castor oil necessary; this in its turn frequently gripes. This the nurse attributes to wind in the stomach and bowels, and again thick indigestible food is given, to drive out the wind, which in its turn again requires the Dalby. In this manner, the functions of the stomach and bowels are too often impeded, and not only impeded for the time, but the children are rendered ever afterwards liable to complaints in the stomach and bowels.

Daily do I see the advantage of pursuing an opposite plan with new-born children. No laxative medicine should be given, unless an infant suffers from distention of the abdomen. Should this be the case, the old plan of using a suppository, or a twisted piece of paper, will in general answer every purpose; but if it should not, then a gentle laxative may be given by the mouth, and the best is a small tea-spoonful of castor oil, or about three grains of Henry's magnesia. With respect to food, an infant ought not to have any thing more substantial than well-made whey, or milk and water, till it can procure food from its own natural fountain.

Some children are so constituted, that, do what we will,

they have more than the natural number of stools, and yet they go on growing and thriving in a remarkable manner. In such cases little or nothing ought to be done, because there is good evidence that there can be no serious disease. Again, some children are naturally constipated, and yet they thrive; in such cases, also, much interference is unjustifiable, beyond changing the milk, or exhibiting a little manna. A healthy child at the breast, ought in general to soil from four to six napkins in the course of twenty-four hours; the evacuations after the first fortnight should look like well-made mustard, with perhaps white specks here and there; it should have a sour smell, and possess no fetor. In disease, the stools are sometimes green and watery; sometimes yellow and watery; sometimes brown and frothy, or white and frothy, as if mixed with yeast; and also whitish and hard, like half-baked clay; occasionally blueish, and very often mixed with slime, or are altogether slimy. When the stools are blueish, and particularly when whitish, like half-baked clay, they are very adhesive, and expelled from the bowel with difficulty. Instead of having the natural sour smell, they are like the stool of an adult; or they may have a still worse smell, sometimes compared to rotten eggs, at others to train oil; and occasionally even still worse, like that which emanates from a gangrenous sore. Green and brown stools are generally watery, or mixed with mucus, and are occasionally discharged, when the child is held out, as if they came with violence from a squirt, and are often preceded by considerable signs of suffering.

The blueish and the whitish stools are generally few in number, but are attended with consequences fully as dangerous to the infant, as they terminate by producing diarrhœa of the most intractable nature. In many of these cases, the diarrhœa alternates with constipation; and occasionally there is so much irritation in the rectum, that prolapsus ani takes place, attended with great suffering.

Many children go on thriving remarkably well, having a regular state of bowels till they are weaned, when, from the sudden change of food, a serious disturbance is occasioned in the stomach and bowels, announced by vomiting and purging, or by purging alone, the stools consisting at first of feculent

matter, then mixed with mucus, and perhaps tinged with blood; and subsequently of a white serous fluid, like dirty water, which is discharged suddenly, and squirted with violence from the bowels. Children so affected are said to have the "weaning brash," which has some resemblance to the true cholera.

Treatment.—If the disease be produced by the injudicious use of laxatives, these are to be discontinued or diminished in quantity, and conjoined with a slight opiate, as, for instance, a quarter or half a drop of laudanum in a tea spoonful of a solution of manna. If from indigestible food, it is to be withdrawn, and the child must subsist entirely upon the breast. If there be good evidence of its own milk disagreeing with it, another nurse should if possible be procured. Green stools are often occasioned by the exhibition of calomel, which is too frequently allowed to be prescribed by nurses themselves. The yellow watery stool, and the brown watery stool, often announce an excess of bile; while the blueish and whitish stools, but particularly the latter, indicate a diminished quantity of bile. In the former cases, a little thin arrow-root, one small dose of calomel, followed by a little castor oil, and an occasional tea-spoonful of chalk mixture, together with the warm bath, will be all that is required. But in the latter cases, five or six half-grain doses of calomel, or one grain doses of hydrargyrus cum creta, given either at night or in the morning, followed by an occasional small quantity of castor oil, and attention to the diet, will be sufficient to put the child in a fair way of doing well. According to my experience, a mercurial preparation is particularly necessary when the stools have the peculiar disagreeable odours formerly described. If much mucus be discharged, particularly if tinged with blood, and expelled as if it came from a squirt; if there are fever, restlessness, peevishness, and thirst, and particularly if the child cries much and emaciates, medical men should be upon their guard, for if inflammation of the mucous membrane do not already exist, there are evidences of its being threatened. Solid food should be carefully avoided; and if the child be already weaned, it should be offered nothing but whey or ass' milk. The warm bath is to be used morning and evening; and I have found powders composed of calomel, aromatic powder,

and Dover's powder, with or without rhubarb, proportioned to the age of the patient, highly useful. To a child of three months old, I would give half a grain of calomel, the same quantity of Dover's powder, and two of aromatic powder, every three, four, or six hours; to a child under that age, a somewhat smaller quantity of Dover's powder may be given, and it should be increased to those who are older. If the feverish symptoms still continue, a leech should be applied, or a stimulating embrocation rubbed upon the abdomen. It is always safe practice to apply a leech early, which is not only justified, but loudly demanded, by the appearances on dissection, when the mucous membrane is seen, not only in a high state of inflammation, but also of ulceration. My Museum contains many specimens and drawings of such morbid changes.

Sometimes we are not consulted till the little sufferer is greatly reduced, and it should be remembered that its vital powers may sink early, from the peculiar severity of the disease. In such cases, we must be guided by the expression and colour of the face, state of the pulse, and the temperature of the body. If the expression be subdued, the face pale, the features sharpened, the extremities and tip of the nose cold, and the pulse weak, a stimulant is instantly to be given, and the best one is brandy and water, proportioned to the age of the child; it may be necessary to conjoin an opiate with the stimulant. The warm bath is also to be had recourse to.

TABES MESENTERICA.

This is a disease in which there is great emaciation of the whole body, and enlargement of the abdomen.

After the bowels have been for some time in an irregular state, the child is observed to fall off very much in strength; the extremities and the face becoming much emaciated, while the belly is observed to be tumid; the appetite is fastidious, sometimes ravenous; there is great thirst, and frequent griping pains. A child so affected has some degree of fever, while another has no feverish symptom; but most commonly there is a febrile attack during the night, which goes off towards morning with perspiration. The abdomen feels doughy and knotty, at

other times tense and tympanitic. At first the tumefaction is owing to flatus; but as the disease goes on, effusion takes place into the cavity of the abdomen; there is constant purging, till at last the child dies exhausted, or is carried off by disease in some other part, commonly of the brain or lungs.

Appearances on Dissection.—On dissection we sometimes discover chronic peritonitis, with enlargement of the mesenteric glands; but more frequently ulcerations of the mucous membrane of the bowels, the effect of long-continued subacute, or chronic inflammation. The whole of the internal surface of the colon is sometimes ragged; the rest of the coats of that intestine being, in general, very much thickened; at other times, the lower parts of the ileum and cæcum are affected; and occasionally ulcerations are seen in the jejunum, increasing in number, however, in the course of the ileum. Occasionally, when there is chronic peritonitis, I have been able to trace it to the extension of the ulceration from the mucous coat of the intestine.

Treatment.—The pathology of this disease appears not to be understood by the generality of practitioners. It is too often attributed to scrofula, merely because the mesenteric glands are known to be enlarged; therefore the muriate of lime is extensively employed by those who are *calcined* in old prejudices, and who are blessed with so much patience, that three years is not considered too long a period to wait for its good effects. The disease should be treated as one proceeding from inflammation and ulceration of the mucous membrane of the bowels, which will also be the best practice, should the disease be found occasionally to depend on chronic inflammation of the peritoneum.

DYSENTERY.

This affection is known also by the name of flux; when attended with a discharge of blood, bloody flux.

Dysentery is generally divided into two varieties,—acute and chronic.

Symptoms of Acute Dysentery.—This form commences like

a common diarrhœa, with griping pains in the bowels; frequent calls to stool, with an irresistible desire to strain; the evacuations are sometimes fluid and copious with the usual fetor; at others scanty; and whether copious or scanty, there is occasionally seen, particularly in this country, some hard scybalous matter, with mucus, sometimes streaked with blood, and very fetid. In warm climates it is rare to see scybalæ; when there is feculent matter, it is very watery. After a stool, the patient feels more or less relieved, but soon another paroxysm of pain, frequently amounting to what has been denominated "tormina," takes place, and he may have a great many such attacks during twenty-four hours. In this country, for the first few days, the heat of skin is not much increased, nor is the pulse accelerated; the tongue is loaded, and generally red at the tip; the thirst is urgent; there is loss of appetite; considerable prostration of strength; and depression of spirits.

After the lapse of two or three days, more or less, the patient complains of fixed pain in the hypogastrium, and in one or both iliac regions, which sometimes becomes very distressing; it is increased by pressure, and I have been able to trace it, on many occasions, along the track of the colon. Sometimes there is universal heat of skin; at others, the abdomen only will feel burning to the hand, while the rest of the body is cool; nay, the extremities may be ice cold, and the patient may complaint of frequent rigors. The evacuations from the bowels, at first feculent and copious, now become more frequent and scanty, consisting entirely of mucus, or of mucus mixed with blood; or they may be still watery, and of a dark brown colour, with portions of slime here and there; or they may have the appearance of dirty water slightly tinged with blood, with now and then a little scybalæ. The stools become more and more disagreeable in odour, till at length an experienced person will be able to recognize the smell to be dysenteric upon first entering the room. The tenesmus is more distressing, together with a cramp-like feel in the thighs and legs, which is relieved after each evacuation; it is with difficulty that the patient can be persuaded to leave the close-stool, and to lie down in bed. The secretion of urine is frequently

suppressed, and the patient suffers a good deal of pain from that cause. Thirst increases; cold water is preferred, from which the patient cannot refrain, although he knows it is bad for him. The tongue is more loaded and florid; or it has by this time become dry and glazed. The skin is either parched, or covered with copious perspiration, which, in the worst cases, does not appear to mitigate the symptoms, although some relief is experienced in slighter instances. When the skin is universally hot and parched, the pulse in general will be found quick, full, and bounding, but when the extremities are cold, it will perhaps feel weak and thready; yet, in some instances, the pulse is not much changed from its natural state, neither are the other symptoms troublesome, till within twenty-four hours of death.

Sometimes the patient preserves some degree of appetite for a few days; but in the course of two or three hours, the articles of food are passed by stool in an undigested state. The patient emaciates quickly; the despondency increases; and as the disease advances, his bodily weakness increases, till at length he is unable to obey the frequent calls to go to the close-stool. He lies upon his back, unable to move, and at length passes his stools involuntarily, which appear as if mixed with shreds of membrane; occasionally they resemble pease-soup, and sometimes are even like pure pus; or they still continue to consist of mucus, more or less tinged: the bowel is constantly in a state of protrusion, and the fetor which emanates from the patient is almost intolerable. In warm climates, I have seen an appearance as if large portions of the mucous membrane had been thrown off in a state of mortification, and I knew one patient recover after such an event. Sir George Ballingall and others mention a similar circumstance as having occurred in their practice; but recovery in this stage is almost out of the question. The pulse sinks; the pain ceases; and the mind, which perhaps has hitherto been quite clear, now becomes disturbed; a cold clammy sweat takes place, and death shortly closes the scene. Hiccup and vomiting are occasional symptoms; and during the progress of the disease, the symptoms frequently undergo remarkable remissions, which excite hopes of recovery. I

have seen the strongest men destroyed by this form of the disease in four days; but in general the case is protracted for two or three weeks.

Symptoms of Chronic Dysentery.—This form is rarely met with in this country, unless in individuals who have come from warm countries, where they had suffered frequent attacks of the disease. In chronic dysentery, patients are affected with severe fits of griping about the umbilicus, like colic, which are quickly followed by an irresistible desire to go to stool, when a great deal of flatus is discharged, along with an evacuation which is sometimes of a dirty brown feculent matter, sometimes even much darker in colour; at others it is greenish or yellowish; and occasionally the stool looks yeasty, or resembles thin gruel; sometimes, according to Mr Marshall, like rice water, or water in which a small proportion of white clay had been diffused. Sometimes there is only a sense of weight in the abdomen, and acute pain is perceived, upon pressure, in the course of the colon, but more particularly in the situation of the caput cæcum. After each paroxysm of pain, and subsequent stool, the patient enjoys a longer or a shorter interval of ease, unless he be scalded about the anus. The skin becomes parched, and the pulse quickened; the appetite is impaired in some cases, while it remains good in others; but the patient will be observed to be worse after a moderately full meal, and occasionally there is nausea. Thirst is a pretty constant companion. The tongue presents various appearances, sometimes loaded, the fur being of a yellow colour; at others it is loaded in the centre, and reddish at the tip; sometimes rough, and often it has the appearance which has been already described in this work, red, raw-looking, and quite smooth as if glazed. After these symptoms have continued from two or three to twelve or fourteen days, the stools are found to consist of whitish mucus, frequently mixed with undigested food, and are almost always passed with considerable straining; the paroxysms of tormina increase; borborygmus is troublesome; the patient loathes food more and more; nausea is more complained of, and bilious vomiting occasionally takes place; thirst increases, as well as debility and emaciation; hiccup is often

very troublesome; and the pulse becomes quicker and quicker, gradually losing its strength, the skin looks sallow, and at last death takes place. In the latter stages, the abdomen sometimes becomes more tumid; at others, it is flatter than usual. Occasionally acute peritonitis cuts off the patient, from the escape of the contents of the bowels into the abdomen through an ulcerated opening.

Appearances on Dissection, with Pathological Remarks.—In this country dysentery is rarely fatal, unless it attacks individuals who have suffered severely from the same complaint in India. Nevertheless, my Museum contains sufficient proof that it is sometimes fatal, and that the *post-mortem* appearances closely resemble those which are found in tropical climates. I have known several fatal cases in Edinburgh, which ran their course in from nine to twenty days, and in which the colon, the rectum, and part of the ileum, were in a state of complete mortification, the parts having the gangrenous fetor. In other instances, the colon and rectum, throughout their whole extent, were thickened and contracted; the mucous membrane being soft and spongy, and dark coloured, looking more like a livid fungous excrescence than an ulcerated surface; the colour being retained even after maceration. An opinion has been too prevalent, that dysentery is always connected with a vitiated state of the bile, or actual disease of the liver itself; but the writings of modern pathologists have dispelled such delusions.

Sir George Ballingall, in proceeding to give an account of the appearances found on dissection, in his excellent work on Fever, Dysentery, &c. states, that in a great proportion of cases these appearances consist of an inflammation of that part of the intestinal tube situated below the valve of the colon, "without the smallest trace of disease in the structure of the liver."

The following are the appearances described by Mr Marshall, Deputy Inspector General of Hospitals, in his valuable work entitled, "Notes on the Medical Topography," &c. &c. I have great satisfaction in quoting from this author, because I know his descriptions were drawn from nature when standing at the dissecting table, with the morbid parts before him, and not

copied from books:—"Upon examining the bodies of Europeans who have died of dysentery, (says he) the extent of structural derangement discovered is often very great."

"*Omentum.* This organ is sometimes found greatly diminished; more frequently it is found much thickened, interspersed with numerous vessels turgid with dark-coloured blood, and easily torn. Sometimes it adheres with great firmness to the intestines, occasionally stopping up ulcers. Perhaps it adheres more frequently to the cæcum than to any other portion of the intestinal tube.

"*Intestines.* The folds of the intestines are often found agglutinated together. Sometimes they adhere to the liver, and occasionally to the bladder. The colon appears studded or streaked with dark red or plum-coloured spots. Sometimes the contents of the intestinal tube are found in the cavity of the abdomen, having passed through a gangrenous orifice in the coats. When handled, the large intestines feel thick, heavy, and lumpy; they are likewise, in many instances, easily torn.

"Upon removing the intestines from the body, and slitting them up through the whole extent, a great number of lumbrici are commonly found; but as worms exist so generally in the intestines of Europeans in this country, their appearance cannot be considered as connected with dysentery. The inner surface of the duodenum is found covered with a viscid, glairy, semi-fluid substance, which has sometimes a yellowish, sometimes a greenish colour. Towards the inferior half of the ileum, small quantities of fecal matter are occasionally found, having a bright yellow colour, and some degree of consistence. The contents of this intestine frequently resemble the healthy alvine evacuations of young children. The colour and consistence of the fecal contents of the ileum are suddenly changed immediately upon passing into the cæcum. Nothing is ever found in the large intestines but a brownish offensive fluid, similar in appearance to the watery dejections which mark the last stage of dysentery. The intestines were never found to contain either scybalæ or fecal accumulation.

"The coats of the small intestines are generally healthy; sometimes they are redder externally than natural; this red-

ness appears to originate from venous effusion, rather than from an actively excited state of the vascular system.

"The mesocolon is frequently found much thickened, and containing a great number of vessels gorged with blood.

"The chief traces of disease are found in the large intestines. The villous coat of the cæcum, colon, and rectum, when expanded, sometimes appears dark red, and extremely turgid; the turgescence is occasionally so great, as to resemble the tumid state of the inflamed conjunctiva during a violent degree of purulent ophthalmia.

"Sometimes the villous coat appears, at a little distance, to be covered with a blueish puriform fluid, and thickly interspersed with dark grumous spots and patches. When more narrowly examined, the villous coat is found to owe the appearance of being covered with puriform matter to an extravasation of fluids into the substance of it, by which means it acquires a swollen and pulpy appearance. The dark red grumous patches are portions of the villous coat in a gangrenous state. These spots are generally surrounded by a red circle, the areas of which are various; frequently they are not more than about a third of an inch. Sometimes an individual slough may be compared to a tainted oyster. The mortified portion of the villous coat that is situated within the red circle is easily removed from the muscular coat, which is commonly found apparently not changed from a state of health. In some instances, the central portion of the slough had disappeared, leaving an excavation in the villous coat, as if a portion of it had been cut out. Even in these cases, the muscular coat was commonly sound. The villous coat was generally unattached at the margin of the excavation, and the finger could often be easily pushed under it from one depression to another. Sometimes, however, the sloughing extended into the muscular coat, and even into the peritoneal coat, which was rendered evident externally by the mulberry-coloured patches. The dark spots on the peritoneal coat are always much less extensive than the corresponding gangrenous portions of the mucous membrane. While one part of the large intestines has lost its natural tenacity from gangrene, another has sometimes acquired an increased power of resistance, and

when cut into, conveys a semi-cartilaginous feeling to the hand. Sometimes large portions of the villous coat are found sphacelated without any intervening living parts. In these instances, it is extensively separated from the muscular coat, and is sometimes found loose in the cavity of the intestine. The gangrenous shreds occasionally stretch across the diameter of the intestine, like a bow-string. The separated portions of the villous coat are torn by the slightest force. They resemble, in appearance, pieces of dirty lint imbued with the ichorous discharge of a gangrenous ulcer.

"Sometimes small collections of purulent matter are found between the villous and the muscular coats. This is, however, not a frequent occurrence.

"Occasionally dysentery leaves traces of disease in the large intestines of a different kind, namely, tubercular ulceration. Ulcers of this character are not unfrequently found spread over portions of the villous coat, and, for the most part, in a remarkably distinct and uniform manner. That portion of the villous coat which intervenes between the ulcers, has in general a loose, pulpy appearance. Sometimes it is turgid and reddish. Viewed at a little distance, the inner surface of the intestine appears to be sprinkled with a soft, curdy-like substance. These cream-coloured specks are of various sizes; sometimes they are not more than a line, at other times they are an inch in diameter. Upon examining a small speck, the whitish substance is found to protrude a little beyond the surface of the intestine, and adhering, but not very firmly, to the villous coat. After removing this substance, a depression or incipient ulceration is exposed. The base and margin of the indentation are generally dark red. The depression eventually increases, and becomes an ulcer, which is always encircled by a red portion of the villous coat. Sometimes the ulcers resemble the ill-conditioned sores, with prominent edges, which occasionally occur on the inside of the lips, particularly during a severe course of mercury. In general, the base and edges of the ulcers are indurated, unequal, and scabrous. When the transverse section is made, a gristly feeling is communicated to the hand. The tubercular appearance of these ulcers is very remarkable. They sometimes resemble warty elevations

with excavated apices, in a state of ulceration. For the most part, ulcers of this kind are oblong: in length, they extend from half an inch to an inch; the breadth is seldom above half the length. The longest diameter is always in a transverse direction to the cavity of the intestine.

"Such are the more common traces of disease found upon inspecting the bodies of individuals who have died of dysentery, more particularly among Europeans. Death rarely, if ever, occurs among this class of people before a certain degree of gangrene of the villous coat of the large intestines has taken place.

"Abscesses and other morbid states of the liver are occasionally concomitants of dysentery. When traces of disease in the liver were discovered on dissection, the circumstance is noted in the table of casualties. The nature of the structural changes of this organ has been already mentioned. Upon examining the bodies of Malays that have died from dysentery, traces of disease of a less active character are discovered. The mesentery and meso-colon are generally found massy and dark-coloured, from turbid blood-vessels and the lymphatic glands greatly enlarged. The coats of the large intestines are thickened and firm; frequently the calibre of the intestine is greatly contracted. The villous coat is, in these cases, unequal, puckered, and covered with a gelatinous muco-purulent substance. Occasionally, however, instances occur where the inner surface of the colon is found sprinkled with grumous spots in a state of mortification, and sometimes the sloughing portions are extensive."

Some years ago dysentery was very prevalent and fatal in Ireland, which afforded Dr Cheyne and others the most extensive opportunities of making *post-mortem* examinations. They had the best proof that the primary and chief seat of the disease was in the mucous membrane of the intestines; the liver was sound in a majority of cases, but often otherwise. In two instances abscesses were found, and in many others great sanguineous congestion.

According to Dr Cheyne, the intestines were variously affected; in some cases they were prodigiously distended; the small intestines measuring from seven to nine inches in cir-

cumference; in some the coats were much injured without thickening; in others considerably thickened as well as ulcerated. In some cases the inflammation of the mucous membrane was most extensive, extending from the stomach to the rectum; the inflammation being always greatest towards the large intestines, the rectum being, however, sometimes sound.

The morbid appearances discovered in the intestines in fatal cases of dysentery, in this country, are considerable thickening of the large intestines; sometimes this thickening affects the whole colon and rectum; sometimes it is confined to the caput cæcum and part of the ascending colon, at others it involves also the arch, and even extends farther. The peritoneal coat generally remains sound. The seat of the thickening is in the mucous coat and sub-mucous cellular tissue, which are infiltrated with blood, spongy with a rough and ragged surface. The colour varies from bright red, to a dark brown.

On other occasions the mucous surface is spongy, rough, and ragged, with deep ulcerations here and there; the ulcerations running principally in the course of the transverse bands of the colon. The colour is sometimes very little changed, and there is little or no infiltration of blood into any of the tissues.

I have likewise seen complete mortification and sloughing of the mucous membrane in two dissections. In these instances, there were large detached portions of the membrane, the sloughing condition being sufficiently well marked by the colour and fetor. The rectum has been implicated in a variety of the cases that have fallen under my observation, but it escapes more frequently in this country than in warm climates. There are some specimens and drawings in my Museum, from which this description has been taken.

Causes.—Dysentery is a disease which attacks individuals of all ages, and all classes of society; although those are more liable to it who are most exposed to vicissitudes of climate, and who are badly fed and clothed. Irregular habits also predispose to this disease. In warm climates it is found that Europeans suffer more than natives. Upon inspecting Mr Marshall's tables, it will be seen that the disease is fatal during every month in the year; therefore it must occur in all kinds of weather. It is more peculiarly a disease of tropical cli-

mates; although we often see it in other situations, yet it is neither so prevalent nor so fatal. It also seems to depend upon the same exciting causes as fever. Although diseased secretion of the bile may occasionally produce both diarrhœa and dysentery, yet these diseases ought not to be so invariably imputed to this cause.

Treatment.—The method of treatment which is generally found necessary in this country, shall be first shortly stated; and then that which ought to be adopted in warm climates in the acute and chronic form of the disease.

1*st*, *Treatment of Dysentery as it occurs in this country.*—The same plan is to be pursued as in severe cases of diarrhœa. The body is to be warmed in a hot bath; and as we are anxious to get rid of any offensive matter that may be in the bowels, in the first instance, an ounce, or half an ounce, of castor-oil is to be given, with twenty, thirty, or forty drops of the sedative solution of opium; but if the stomach be too irritable to bear the castor-oil, calomel, with a small quantity of opium, is to be given in pills every second, third, or fourth hour, till a feculent evacuation is procured, assisted by a large injection of warm milk and water, or thin gruel; or small doses of salts may be given by the mouth, and repeated at short intervals. It is wrong to suppose, that in all instances of dysentery in this country, there are hardened feces lodged in the bowels; but as this is sometimes the case, and certainly more frequently than in warm climates, the plan above recommended should in the first instance be adopted. This points out the necessity of a careful examination of the alvine evacuations, which has been already so much insisted upon in other diseases.

If, however, a patient have considerable griping and tenesmus, hot skin, and a quick pulse, although it may not be particularly strong, it will be right to bleed him, especially if there be pain on pressure; and perhaps it will be safest to draw blood before the laxatives are administered. One good bleeding will in general suffice; if there be much subsequent tenderness of abdomen, leeches may be had recourse to. After the diseased action has been thus reduced, and the scybalous matter got rid of, we may have recourse to large opiates by

injection. It appears to me that the reason why opiates are not attended with more success, is that they are exhibited in too small quantity, and that they do not proportion the dose, in any degree, to the violence of the symptoms. If we suspect the liver to be disordered, small doses of calomel or blue pill may be given, but there is no necessity for greatly affecting the mouth.

Contra-irritation to the abdomen is to be had recourse to, and the best method of producing it, is by the frequent application of hot oil of turpentine; but should the disease be very severe, it will be advisable to apply a blister. The attendants should be particularly cautioned to watch the heat of the extremities, and to apply hot bottles when necessary.

In the excellent clinical reports with which Drs Stokes and Graves have lately favoured the profession, it is stated, that strychnine, in doses of one-twelfth of a grain, given in a pill twice a-day, was found useful in the Meath Hospital. They tried this remedy on the authority of a paper by Dr Rummel inserted in the June Number (1825) of Hufeland's Journal. On some late occasions this remedy has been tried in my practice, and was found exceedingly beneficial, even in cases where there were most extensive ulcerations in the bowels. It succeeded after every other remedy had failed. I have also seen beneficial effects from the acetate of lead, given in two or three grain doses several times a-day. The sulphate of copper has also been strongly recommended in such cases by Dr Elliotson; I have given it a trial, and can speak rather favourably of the result.

The sufferings of patients are often much aggravated by flatulent distention of the intestines, which may generally be relieved by turpentine, assafœtida, or tobacco injection. During convalescence, the greatest attention must be paid to diet, clothing, and exercise.

2*d*, *Treatment of the acute disease as it occurs in warm climates.*—The only difference which is to be kept in view between the treatment of the disease as it occurs in this country and in tropical climates, is, that the disease being in the latter more severe, requires more active practice. It is also necessary to impress on the minds of those who are destined

to practise in warm countries, that cases are frequently fatal, although the symptoms are apparently mild. That such cases are frequent, any reader may satisfy himself by consulting the works written upon this subject; and it has led some to divide the disease into two varieties. For instance, Mr Annesley states that there are two varieties, the acute and erythematic. "The first," says he, "is acutely inflammatory, and if not checked by bold and decided practice, will very soon terminate fatally, or lay the foundation of that chronic stage of dysentery which disables so many men. The second is more obscure, and consequently more dangerous. There is dull, deep-seated pain in the bowels, sufficient to distress a patient, but not so severe as to excite alarm. There is no external pain, the pulse is not materially altered, neither is there any increased febrile action. This disease," continues he, "is confined to the mucous membrane of the colon, and consists of a less acute form of inflammation of this membrane. If not treated successfully, it runs at once into ulceration throughout the whole intestines."

These extracts are taken from Mr Annesley's octavo work, which contains much valuable information. It appears to me, however, that the term erythematic is most unhappily chosen, at least in contradistinction to the first variety, as the inflammation in both cases may be said to be erythematic.

Great prejudices have prevailed in India, and I fear still exist among the older practitioners, against the employment of general bleeding both in fevers and dysentery; and the action of calomel is too much trusted to in these diseases. Dr Johnson and Sir George Ballingall were among the first who, by example and precept, endeavoured to root out this error, by an appeal to the morbid appearances which have been already described. In later times, we have received additional testimony of the advantage of general bleeding. Mr Annesley, in detailing the treatment of the acute form, when it occurs in plethoric individuals, recommends general bleeding, and states, that much is to be done in a few hours, and if it be not got under controul in that time, the patient is either lost, or the basis of a broken constitution is laid. But in those who have been long in India, and, I suppose he means,

who have shattered constitutions, he says leeches will answer better, because they "diminish action without destroying power; and any quantity of blood may be taken by them." I cannot agree with this too sweeping statement; for I am certain, by experiment and careful attention, that individuals will bear the loss of blood better, ounce for ounce, by general bleeding, than by leeching. The cause of this remarkable circumstance cannot be determined, although it appears probable that it may in part be attributed to the long-continued unpleasant sensation produced by the biting of the animals, and to the fatigue of the operation; but I am satisfied of the fact. Leeches are certainly to be preferred, however, when the disease is of long standing; they operate beneficially in many cases, when general blood-letting would no doubt prove injurious. Two great advantages which the lancet possesses over leeches, are, that we can stop the bleeding from a vein in a moment, and promptly alter the determination of blood.

At page 278. of Mr Annesley's octavo work, the following passage will be found:—"Full doses of calomel, with such other purgatives as act upon the mucous glands, are required here, and should be continued without intermission till healthy action is produced." To those who have seen the morbid changes produced on the intestines, who know and are acquainted with the dreadful mortality which is caused by dysentery among Europeans, and who have seen individuals reduced to premature old age sent to this country on the pension list, will join me in stating, that much injury has been inflicted by the mercurial treatment too generally pursued by medical men in the East; and upon which the passage last quoted affords me an opportunity of commenting. At this moment, I have before me the detail of many cases, which have been corroborated by frequent communications with practitioners who have served in India, of the baneful effects of the practice which seems still to be inculcated by Mr Annesley.

It is the custom in India to give calomel in large and frequently repeated doses, which is followed by the daily exhibition of drastic purgatives, which are given, to use Mr Annesley's words, "to act upon the *mucous glands*, and are to be continued without intermission." Under this treatment, the

proportion of deaths is sometimes so great as 20 per cent. and on some occasions, it has been known to be about 30 per cent. Thus, Sir George Ballingall has shewn, that in his Majesty's 59th Regiment, during eight months of the year 1806, ninety-seven men were affected with dysentery, of which number twenty-eight died. In his Majesty's 30th Regiment, during seven months in 1807, four hundred and ninety-one men were affected with dysentery, of whom eighty-five died. And in the Royals, during eight months in 1808, five hundred and forty-one men were affected with the disease, of whom ninety-eight died. I have also some details of the result of the mercurial practice in India, in my possession, which shew the enormous quantities of calomel exhibited in dysentery of late years, with the bad success of the practice. It is no uncommon thing for an individual to take three hundred grains of pure calomel, before he dies under the digestion of it. One individual took the enormous quantity of five hundred and twenty-three grains; another, six hundred and ninety-five; a third, seven hundred and sixty; and a fourth, nine hundred and seventy-four, which last is somewhat more than sixteen drams! So far from curing inflammation and ulceration of the mucous membrane of the bowels, there is no plan more likely to produce these states; but it is doubtful, whether the calomel or the continued use of drastic purgatives is most injurious. The generality of purgatives operate by producing irritation and increased secretion on the whole mucous surface, which ought to be carefully avoided. It appears that many practitioners act upon the principle of getting rid of the mucous discharge, as if it were lodged in the bowels, acting like a poison; whereas it is to be regarded as the effect of increased action. Let it not be supposed that I object altogether to the use of calomel; on the contrary, I believe that, combined with opium, its occasional use is most advantageous. My observations are only intended to prevent our trusting entirely to its operation, and to guard against its abuse. I shall conclude, by quoting the result of Dr Cheyne's experience in the treatment of dysentery, with respect to mercury, stated in the Dublin Hospital Reports, and that of Mr Twining in the General Hospital at Calcutta. "Mercury," says Dr Cheyne, "could

not be depended upon, and did not relieve in numerous instances when the mouth was affected, and sometimes seemed to increase the disease; and even when the symptoms distinctly pointed out a morbid organization of the liver, the result of this treatment was unsatisfactory." My own experience in this country, as well as within the tropics, enables me to confirm the above statement.

Mr Twining, to whose talents and industry medical science stands deeply indebted, recommends V. S. and the application of leeches, to decidedly reduce and permanently keep down any frequency and hardness of the pulse. He perseveres in this practice as long as pyrexia exists, or pressure on the belly gives pain, or there is any blood in the stools. He gives a laxative, and then six grains of ipecacuanha powder, with four grains of pil. hydrarg. He rarely uses calomel.

" Notwithstanding all that has been written," says Mr Twining, " in praise of the general employment of large and repeated doses of calomel in the dysentery of India, whether that medicine be used to the extent of producing salivation or not, it will be easy to shew, calomel is often not only useless, but in many cases of the dysentery of Bengal, it is exceedingly injurious. I speak without hesitation on this subject, from having too often seen the fallacy of trusting generally to the effects of calomel for the cure of severe acute dysentery, and having tried that medicine extensively, in every form of the disease." *

Treatment of Chronic Dysentery.—It must always be recollected, that no case of dysentery is to be regarded as altogether hopeless. From the recoveries which I have seen made, and from the dissections at which I have been present, of individuals who have been long afflicted with the disease, it may be stated as a fact, that the mucous surface heals and becomes restored, if not to its primitive healthy state, at least in such a degree as to preserve life for many years. It is rare in chronic dysentery that we shall be called upon to take blood from the arm, but the occasional application of leeches is most serviceable, together with contra-irritation, gentle laxatives, an occasional opiate, and astringent medicines, such as catechu,

* Vide Diseases of Bengal, by William Twining, Esq. page 40.

and solution of sugar of lead, and sulphate of zinc. Great care must be taken of the bowels and the diet; small quantities of light and digestible food are to be allowed at each meal, and the patient should not be permitted to eat oftener of any thing than once in five or six hours. I have been very successful in the treatment of chronic dysentery, by following this plan, together with an occasional warm bath, and long perseverance in the use of tartar-emetic ointment, as well as by the occasional employment of mutton suet boiled in milk, which is to be strained immediately after it is taken off the fire; sugar is then to be added, with a little spice to make it palatable; about four ounces of this are to be taken once or twice a-day, mixed with rice,* if the patient's stomach will bear it.

CHOLERA.

This term, together with its adjunct, "*Morbus*," is employed, even in common language, to express that a person is affected with vomiting and purging.

This disease presents itself to us in two forms: 1*st*, That which has been so long known in this climate, and which occurs so frequently in warm seasons, more particularly when fruit is plentiful, and which is called *Cholera Morbus*. 2*d*, That form which so long prevailed in the East, and has lately visited Europe, which has obtained the name of *Asiatic Cholera*.

1*st*, *Cholera Morbus*.—The disease usually presents the following phenomena. The first symptoms are, nausea and griping sensations, which, generally speaking, come on suddenly, and soon terminate in vomiting and purging. In very severe cases, the body, and particularly the extremities, become cold; the breathing is anxious and hurried; the features shrink; the eyes become hollow, with an expression of great

* This is an old remedy; it is mentioned by Sir John Pringle.—The patient should in general be kept ignorant of the nature of the preparation, for fear of exciting disgust.

anxiety in the countenance; the pulse small and contracted, soon becoming so weak as scarcely to be felt at the wrist; the thirst excessive; cold water is the beverage most preferred, which is no sooner swallowed than rejected. A cramp-like feel is complained of in the legs, and sometimes in the arms, as in the severer cases of diarrhœa and dysentery, and occasionally spasmodic contractions of the muscles of the abdomen take place. The discharge from the bowels, in this country, is generally watery, with very thin and offensive feces. Occasionally the discharge looks like water in which meat had been soaked; at other times, dark bilious matter is passed in the first stage of the disease, both upwards and downwards, and subsequently the watery discharge takes place.

Sydenham, in treating of the symptoms of cholera, which prevailed in London in the year 1669, states, that they "often destroy the patient in twenty-four hours."—(Swan's Ed. p. 147.) The following case of cholera proved fatal in Dublin in thirteen hours, for the history of which I am indebted to Mr Marshall.

"Private Dickie, 26th Regiment, aged 19, was brought to the hospital on 13th August 1826, in a state of great exhaustion, labouring under violent vomiting and purging, with which he had been attacked about an hour previously. He is also affected with severe spasmodic action in the bowels, and cramps in the legs; the matter vomited is bitter, and has a dark-green colour,—that passed by stool, has a dirty grey appearance: face and extremities of a livid hue, cold and clammy; no pulse at the wrist; the action of the heart is very obscure; articulates with difficulty, and moans incessantly; he cannot protrude his tongue; eye-lids half closed; appears on the point of expiring, and he died before the lapse of twelve hours from the time of his admission, notwithstanding the adoption of the most judicious practice.

"The only probable cause ascertained, is the drinking a quantity of porter before going to bed last night, but not to intoxication."

Causes.—The causes are similar to those which produce other bowel complaints; as cold feet, suppressed perspiration from sudden exposure to cold, cold drinks when the body is

much heated from exercise, crude vegetables, fruits, constipation, &c.

Cholera prevails in this country chiefly in the autumn months succeeding to hot summers. In 1808, many very bad cases fell under my notice, and again in the autumn of 1825.

Treatment.—An emetic, consisting of a tea spoonful of mustard, in a large tumbler of warm water, is often serviceable, when a suspicion is entertained of acrid matter in the stomach, whether it be vitiated bile, or indigestible food. Fomentations should be applied to the abdomen, and the extremities warmed. It is too much the practice to exhibit strong purgatives in such cases, with a view of assisting nature to expel quickly offending matter from the intestines, but I could never convince my mind of the propriety of such a proceeding, when the evacuations are already so numerous; on the contrary, it always appeared to me that opiates are indicated, and experience has convinced me of the necessity of this practice. Opium ought to be conjoined with calomel, in the proportion of two grains to three or four grains of opium, for an adult. These two powerful remedies conjoined, are found to allay irritability of stomach better than any other means. The calomel may be of service in improving the secretions, particularly the secretion of bile, if it be disordered. But large and repeated opiates, by the rectum as well as by the mouth, are frequently necessary. Stimulants are always to be exhibited when the extremities are cold, when the countenance and pulse exhibit signs of exhaustion, and when there are much irritability of stomach and pain in the abdomen. In general, brandy, or some other form of ardent spirits, is required.

During recovery, care must be taken to restore the healthy action of the stomach and bowels, by gentle, unirritating aperients, perhaps a short alterative mercurial course, and slight bitters, may be of use. The stimulants should be withdrawn by degrees, and finally omitted as the case improves; and the stomach should not be oppressed too early with food.

2*d*, *Asiatic Cholera.*—This, the most formidable disease of modern times, has obtained several appellations, viz. Cholera

Spasmodica, Cholera Asphyxia, &c. The term, "Asiatic Cholera," is adopted in this work, until a proper pathological name can be given to the disease; every one, even in common life, knows its signification, while the other appellations imply erroneous theoretical views of the nature and seat of the disease, the adjunct "Asphyxia" being quite as appropriate to pneumonia, bronchitis, or fever of any variety. In truth, it might be added to the name of any dangerous disease, as most people die "from want of breath."

Nearly two hundred years ago, a Portuguese named Mandelo, in describing the diseases at Goa, makes the following statement:—"The change of seasons from one extremity to another, is the cause of many diseases among the Portuguese, but the most common are those which they call *Mordexin** or *Mordechin*, (the Hindostanee name for cholera,) which kills immediately,—burning fevers and bloody fluxes, against which they have in a manner no remedy but bleeding." †

Cholera appeared in India in the worst form in which it had been observed by any living individual, in August 1817; since which time it has attracted very great attention. It has also been observed in the islands situated in the Indian seas; more lately, many thousands of the inhabitants of Russia and Poland have fallen its victims, and it has since visited most parts of Europe and America, causing every where the most frightful ravages, and sparing, comparatively, few of those it attacked.

In the former editions of this work, I was necessitated to compile the article on cholera from what were considered the best sources, having never had an opportunity of investigating the disease myself. Since then, I have unfortunately had ample means of seeing the disease, and investigating its nature and seat, having acted as Physician to the Drummond Street Cholera Hospital, in Edinburgh; into which establish-

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* This term has been corrupted into *mort de chien*, as Mr Marshall informs me, by a pun made by Sonnerat.

† Travels into India in 1639, by John Albert de Mandelo, published in London in 1662, with the voyages and travels of the ambassadors, &c. &c.

ment there were received 461 patients, of which number 291 died; of these, 280 were examined most minutely, to ascertain the cause of death.

It was with much reluctance that I accepted the appointment, from a feeling that, having a large family, I had no right to place myself in such a dangerous position. I likewise felt that my health, which was then rather impaired, would break up under the increased demand made upon my time, already too much occupied; and lastly, that my private practice must suffer considerable injury, as few people, when cholera was almost universally believed to be contagious, would send for me, knowing that I might come to them loaded with the contagious virus from the Hospital. With all these feelings against the undertaking, and the urgent entreaties of particular friends, and having, at the same time, neither expectation of reward to myself if I survived, nor suitable provision to my family if I perished, I at last accepted the office; having done so, I made every preparation, even by increasing my establishment of horses, to enable me to perform the duties to the best of my ability. The disease lingered a long time in Edinburgh and its vicinity. The Drummond Street Hospital was in great favour with the suffering poor; on an average, during the eleven months that cholera prevailed, I made seven visits daily, often the number amounted to ten. Every night, with few exceptions, I made a visit between the hours of twelve and two. During the epidemic, I remained in the Hospital, going from room to room, thirty complete nights,—which was sometimes necessary, from the young medical gentlemen being worn out, and also from the drunkenness that too often prevailed among the nurses. With few exceptions, each body was carefully examined after death, with the view of unravelling the mysteries of this dreadful disease, and ascertaining its true pathological character; and, for the most part, these examinations were conducted with my own hands. Two hundred and eighty bodies were opened, and we were generally occupied two hours with each. Twice was I seriously injured by punctures; and on one of these occasions, my life was in jeopardy, from the inflammation spreading along the absorbents, accom-

panied by erysipelas of the whole arm and side of the body. Had I expected any honour or reward for my services, how grievously disappointed must I have been! The epidemic having at length terminated, there was no offer to remunerate me even for the expense incurred in purchasing and keeping an additional pair of carriage horses; there was no letter of thanks, till the circumstance was mentioned to one of the Members of the Board of Health, who went to the office, and desired the secretary "to write a letter of thanks to Dr Mackintosh, and that he could scarcely make it too strong"!! Knowing the irregular and shabby manner in which it was got up, I put no value upon this document; and this is my only reward! Soon afterwards, two vacancies for Physicians took place in the Royal Infirmary of Edinburgh. I will confess I was most anxious to obtain one of the appointments, but felt reluctant to become a candidate, till a memorial was presented to me, signed by almost all the students attending the Royal Infirmary, requesting me, for their sakes, to offer my services. The influential Managers of the Infirmary had been Members of the Board of Health; they all knew, and acknowledged to me privately that they knew, of my great exertions, not only in attending the sick, but in investigating the nature and seat of the disease, and in having mainly assisted in organizing an efficient hospital establishment. But when the day of election arrived, I was passed over; for which I stand indebted to the Honourable Medical Managers. To console me for this disappointment, I had, by calculation, sustained a loss of two hundred pounds by the falling off of my private practice. This is my case, and I take this opportunity of giving it publicity.

Phenomena of Asiatic Cholera, as it appeared in this country.—The disease consists of three stages. The first stage may be called *premonitory;* the second, *the stage of collapse;* the third, that *of consecutive fever.*

The 1*st Stage* is characterised by symptoms of indigestion, flatulent disturbance in the abdomen, præcordial weight or oppression, slight nausea, acidity, griping pains, diarrhœa, vertigo, some degree of headache, or tinnitus. These symptoms, even when accompanied by spasms, are too often either

disregarded or concealed, till the second stage is far advanced. It is most unfortunate, that this reluctance to confess the early part of the indisposition should so frequently exist in all classes of society, but particularly among the poor, because few of the more severe maladies to which flesh is heir are so remediable as cholera in the first stage, and not one more hopeless after the lapse of a few short hours.

It is stated by the Russian physicians, that at Orenberg, Moscow, and other places, scarcely a person escaped, during the season when cholera prevailed, without some disorder of the stomach and bowels,—indicated by nausea, vomiting, and oppression at præcordia, indigestion, pain in the belly, and looseness of bowels. Many instances of disorder of the stomach and bowels prevailed during the epidemic season, and for some weeks before there was a well-marked case of cholera in Edinburgh.

2*d Stage*.—The duration of the premonitory or first stage is various; sometimes the unpleasant symptoms suddenly cease, and the patients recover quickly; but this happy issue is comparatively rare, when proper remedies are not used; and in some few cases, from the peculiarity of constitution of the patient, remedies seem to have little effect in arresting the progress of the disease, even when applied in this early stage. The stools, which were at first feculent and bilious, now become characteristic of the true Asiatic Cholera. They have the appearance of very thin gruel, or rice-water; sometimes they are watery, limpid, with small flakes of curdy-looking matter intermixed; at other times, they present an appearance of water in which fresh beef had macerated. The usual feculent smell has vanished, instead of which the stools have a peculiar odour, which struck me to resemble that produced by macerating fish in water; a similar odour is generally observed from the surface of the body. More rarely, the stools look like the lees of Port wine; and it was remarked, that almost none recovered who passed "Port wine stools;" I recollect at present one recovery only in which there was this appearance,—it was the case of Field, who was saved by saline injection into the circulation. The desire to go to stool is irresistible and instantaneous; tenesmus is great

in some cases, sometimes preceded or accompanied by a sense of heat or griping. The stools are generally very copious,—sometimes, however, scanty; often accompanied by loud discharges of flatus from the bowels. Along with the bowel-complaint, there are burning heat in the region of the stomach, and vomiting of large quantities of a similar fluid from the stomach. The abdomen feels doughy. The thirst is intense, and there exists an urgent desire to drink cold water. The mind, for the most part, remains comparatively entire, but the vertigo and tinnitus increase. Cramps are general attendants,—sometimes confined to the fingers and toes; at other times they affect the muscles of the extremities, and often those of the trunk of the body, more particularly of the abdomen. The urine is generally suppressed, early in the disease. The voice is whispering, the person being unable to speak in any other tone. The respiration, although weak, is often nearly natural in other respects, even at times when the pulse is scarcely perceptible at the wrist; occasionally, however, the breathing is hurried and oppressed, sometimes laborious. The pulse becomes weak and rapid early in the disease, even when the action of the heart is comparatively strong and tumultuous; but frequently both the pulse and action of the heart are feeble. As the disease goes on, both become more and more weak; the pulse is only now and then felt like a "flutter," and often ceases to be perceptible at the wrist for some hours before death. The tongue is cold and shrunk. It is quite painful to a by-stander to watch the restlessness and impatience of the sufferers, who are constantly in a state of jactitation, more particularly when restrained, and when heat is applied. Indeed, they seem to have a horror at, and to suffer pain from, warm applications. The temperature of the body, but more particularly of the extremities, diminishes early in the disease, and goes on sinking. It is often impossible to raise the temperature of the body during life, but the moment death takes place, and for two or three hours afterwards, the body becomes warm,—even the icy coldness of the extremities gives place to a genial warmth. The colour of the hands and feet become changed, more particularly the nails assume a blue appearance; the face often is

similarly affected; occasionally the whole surface presents a blue colour, and, consequently, the second stage has sometimes been termed "the blue stage;" but it is an error to suppose that the blueness is invariable, or that it is an attendant only on the worst forms of the complaint,—the patient who had this appearance more strongly marked than any other, was the one who made the most rapid and the most complete recovery. Blood, drawn from an artery or vein during this stage, flows with difficulty, is of a dark colour, does not coagulate or separate any serum. It remains in a semi-fluid state, and has the appearance which the ancients called "*dissolved blood.*" The surface of the body is covered, for the most part, with a cold exudation, the features and eye-balls shrink, and death closes the scene,—sometimes very unexpectedly, at others the body seems to be long dead, while the functions of the brain are still going on and comparatively entire.

Sometimes the prostration of strength is extreme; but it is my belief, that muscular debility is no part of the disease, till far advanced in the second, or collapsed stage. I have been surprised at the efforts made by patients when they were thought to be near death. Several patients ran to the hospital after seizure, and one walked from Bonnington Bridge, near Newhaven, to Drummond Street, a distance of two and a half miles at least; he was as blue as indigo, and his pulse was so weak before starting, that it could scarcely be felt. The appearance of muscular debility is occasioned by the vertigo, which renders the gait unsteady and tottering, as well as by the dread of motion producing cramps.

Many exceptions might be made to this account of the symptoms in these two stages. Sometimes no premonitory symptoms can be traced. I know of one case, where the person appeared to have died under the effects of the first attack of cramps; he was known to have laboured under slight bowel complaint for several days, but he did not confine himself, and was lying without any complaint on a sofa; he was dressed, and engaged reading. A noise was heard, and he was soon after found on the floor on his face, dead, with the book clenched in his hand, and his muscles rigid.—I have

seen several cases where the urine was not entirely suppressed, and others in which the stools were feculent and bilious up to the moment of death. But those cases are to be regarded as exceptions to the rule, which they do not contravene. The symptoms in this disease, as in all others, must suffer modifications from peculiarity of constitution, previous condition of health, and habits of the patient affected.

The symptoms which present the most unerring characteristics of Asiatic Cholera, are diarrhœa, and other symptoms of disordered stomach and bowels, in the first or premonitory stage. I believe previous diarrhœa may be discovered in at least four out of six cases, and probably exists in all, if the history of each were perfect. Thus, in the city of Albany, U. S., diarrhœa occurred in 282 out of 336 cases; in the remaining 54, it could not be ascertained whether this symptom had or had not existed. In the stage of collapse, there are the whispering voice, great restlessness, characteristic discharge upwards and downwards, cramps, suppression of urine, excessive thirst, weak faultering pulse, weak respiration, coldness of extremities, shrivelled hands and feet, bedewed with a cold exudation. The general blueness, when it exists, is also quite peculiar to cholera. It is remarkable how quickly an extremely collapsed state of the features takes place. The patients appear to dread hot applications. The blood-vessels, on such parts of the body as the temples, where they are comparatively superficial and easily seen, are observed to be full of blood of a very dark colour; even the serpentine branches of the temporal artery can be traced in this manner, and the motion of the blood is very slow.

3d Stage.—A large proportion of patients died in the 2d stage; there were few immediate recoveries from collapse, without undergoing the danger and miseries of a consecutive fever, which is now to be described. I shall never forget the joy expressed by all who were watching the first case of cholera in which death did not take place in the stage of collapse. This feeling was increased as the watery diarrhœa, vomiting, and cramps, diminished, and at last ceased, and as re-action became more evident and permanent. Nor shall I attempt to describe the subsequent disappointment, as bad symptoms

arose one after another, to convince us that the patient, although he had made an escape from one set of dangers, was still surrounded by another, which experience speedily proved to us were extremely formidable.

The symptoms that denoted an escape from the horrors of the second stage, were, diminution in the number and quantity of the evacuations, both from the bowels and stomach; cessation of restlessness, thirst, and cramps; increase of the temperature of the body, and strength of the pulse; an expression of animation in the countenance, and a disposition to sleep. Sometimes the stools speedily lost the characteristic watery appearance, and became feculent; but this change was generally gradual. Sometimes the secretion of urine took place early after the re-action was established, but this favourable circumstance rarely occurred so soon. In some cases, after every thing appeared to be going on well, the vomiting and purging suddenly returned, the pulse became weak and quick, and the patient rapidly died.

The phenomena of the third stage presented every appearance of fever; sometimes of that form denominated in this country "Typhus," and in several cases a similitude was easily traced to the last stage of Yellow Fever. In fact, the general opinion that was, and still is maintained, that cholera is nothing but a fever, with violent irritability of stomach and bowels, suppression of the secretions of bile and urine, with a cold stage, appeared to derive support from the resemblance to the phenomena of intermittent fever. But it will soon be in my power to shew how erroneous this opinion really is, when the pathology of cholera falls to be considered.

After the complete developement of re-action, patients for a time appear to be doing very well, not teased with violent tenesmus and vomiting, nor disturbed with intense thirst and violent cramps. The restlessness has ceased, and they seem to be enjoying tranquillity. But this state is generally to be regarded as a calm which is too soon to be followed by a storm. The subsequent symptoms vary much in different cases, depending on the previous state of health and habits of the patient, and his peculiarities of constitution, as well as

on the phenomena of the previous stage, and the treatment pursued.

These symptoms were, lethargy or coma, which were frequent; delirium; convulsions; paralysis; rigidity of the flexor muscles of the extremities; distressing nausea; bilious vomiting, and thirst; dyspnœa, or hurried respiration; cough, expectoration; palpitation and irregular action of the heart, and more or less heat of skin; bilious diarrhœa; Port wine stools; tenesmus; and pain or tenderness, increased on pressure, in some part of the abdomen. Of all these symptoms, convulsions were the most rare. The others existed variously combined and modified.

Causes of Cholera.—The undivided opinion of medical men who saw the disease in India, is, that in the East it is not contagious. After the appearance of cholera in Russia and Poland, however, a belief became prevalent that the disease had been modified by climate, and the habits of the people in Europe; that it had more resemblance to a fever, and was highly contagious. There were few medical men who were not influenced by this specious statement; and I confess that my mind was at one time so strongly impressed with the belief in the contagious nature of the disease, that for the first five or six weeks after its appearance in Edinburgh, when I retired to bed at night, I scarcely expected to find myself alive in the morning. But my fears were at last dispelled, and my opinion is, that if it be contagious, it is not so in any very great degree. The following are the grounds on which this opinion is formed.—It was intimated to me, by authority, that as the disease was so contagious, every possible precaution must be taken to prevent its extension, and that *few bodies could be allowed to be opened*, as the contagion was more virulent and searching after than before death. But from the moment my mind was made up to accept the appointment, I resolved that fear should not be allowed either to interfere with my attendance on the sick, or to hinder my investigations after death. Accordingly, in attending the first case of cholera in the hospital, I remained in the ward all night, and became so much exhausted, that I fell fast asleep in the bed next the dying person, and slept for above an hour, at a time when my animal spirits

were low, and my physical strength diminished by the fatigues of the previous day. Subsequently, I have more than once accidentally fallen asleep on a bed on which some unfortunate had died, and in a ward in which there were several dying persons at the time. None of the House Surgeons, the number being between 20 and 30, who were seldom out of the wards, had the disease, although their bodies must have been ready to receive the contagion, if fatigue of body, anxiety of mind, and want of sleep, ever predisposed any person to take a disease. Two male nurses had cholera. One was a sober man, and although he had the warning diarrhœa, he neglected himself, but had the disease slightly. The other was a complete tippler; he had a slight bowel complaint, which he concealed, and by way of curing it, obtained leave to go home to see his family; he got drunk, and was brought to the hospital with cholera, but never became collapsed. Several female nurses were also attacked; but that is no wonder, for, independent of the fatigue they underwent, they were drunkards, and bad characters in other respects; and were actually in the habit of drinking the spirits and wine served out to their patients. Two of these characters, after much fatigue and a hard course of drinking, went to bed one night quite drunk; they were both speedily seized with cholera,—one died. But there is no proof of the influence of contagion in these cases In truth, no case has ever been advanced in proof of the contagious nature of cholera, that cannot be explained on other and more satisfactory principles. Is it because four children, with father and mother, in one family, have had cholera, and because communication can be proved between them and an infected house, by means of a bundle of dirty clothes, or a web of linen, or actual personal contact, that we are rashly to attribute the whole to contagion? The same story may perhaps be told in a different way.—The father is a dissipated good-for-nothing man, who spends almost all his wages on whisky; he deprives his family of the means of procuring suitable nourishment; the poor mother has pawned her last blanket, to purchase a few potatoes for her starving children, who have all had loose bowels for several days or weeks. The explanation is easy to shew the strong predisposing cause—insufficient cloth-

ing, deficiency of food, &c. What answer can be made to this fact, that I have seen several mothers suckle their children when they themselves were dying of cholera, and in one instance I found an infant sucking its dead mother's breast,—and yet not one of them had a symptom of cholera, at least for months afterwards? The wife of the first person attacked with cholera in Edinburgh, was found "*dead drunk*," lying with her face on the breast of her dead husband, whom she had robbed of his stimulants; yet she escaped the disease!—I shall drop this subject after submitting the following statement to my readers. In the Drummond Street Cholera Hospital there were 280 bodies examined. Two, and sometimes three hours, were spent in examining each body. From the economical arrangements of the Board of Health, and the difficulty of procuring a proper apartment, the dead-room, where these examinations were conducted, was a miserable place about eight feet square; generally six or eight persons were present, sometimes more; and in an inner apartment, about ten feet square, there sometimes lay six dead bodies. Not one of those who frequented this den of death, and who had their hands imbrued in the secretions of the dead for six hours out of the twenty-four, were affected with cholera, although their hands were irritated and punctured daily!

It cannot be denied that some mysterious influence was operating at the period cholera prevailed, by whatever name it may be called,—that it selected its own victims—exercised its poisonous qualities in one district, town, or hamlet, more than in another—changed the scene of its ravages suddenly and capriciously, and made its progress from place to place, by strange detours, avoiding many populous situations, in the direct tract of human intercourse.

This influence shewed its visible effects on the stomach and bowels, by embarrassing the functions of the various organs connected with the digestive functions. Mr Dick, the Professor of Veterinary Medicine in Edinburgh, published a paper in the "Veterinarian" for April 1833, wherein it is shewn that cholera was by no means uncommon among domestic animals, particularly horses and cows, during the epidemic sea-

son in Edinburgh. They had diarrhœa and rigid cramps; the blood was viscid and dark; the discharge from the bowels resembled that from the human subject. Several animals died suddenly, and the appearance on dissection resembled those in the human subject, particularly in the stomach and bowels.

Were any persons more prone to contract cholera than others? This is an important question, and it is rare that a point in medical investigation can be so satisfactorily answered. All who had any important visceral disease, or tendency to bowel-complaint from slight causes, and drunkards, were the persons generally attacked. It is no doubt certain, that in each locality where cholera prevailed, some instances may be quoted to the contrary; but these are very few indeed, and are to be regarded as exceptions to the general rule. Nothing could be more unsatisfactory than the accounts we received of the previous health and habits of patients; very frequently we found them to be quite the opposite of what had been stated; but when we opened the bodies, in the careful and minute manner in which the dissections were conducted, we had the best evidence that few subjects were even tolerably sound.

Persons advanced in age, had, in the epidemic that I saw, a bad chance of recovery. Females seemed to be more liable to the disease than males. Almost every woman we opened, under a certain age, had the catamenia; and we found a great number of diseases, of various kinds, of the uterus, ovaries, tubes, and broad ligaments.

Morbid appearances observed in Cholera.—These might be divided into those appearances connected, and those unconnected, with cholera. It appears to be not only proper, but necessary, to separate these into two classes of morbid appearances, when we are collecting evidence to enable us to draw legitimate conclusions regarding the nature and seat of any disease. This may not be easy, or even possible, in every case of cholera; but in general it is a task readily achieved by any one who has been so much employed as I have been, for nearly thirty years, in making pathological researches. A distinction must also be made between the appearances found

in persons who died in the stage of collapse, and those in the consecutive fever, or third stage.

Among the appearances we met with unconnected with cholera, may be mentioned, tumours, and old abscesses in the brain; ancient thickenings, and osseous productions of the membranes; diseases of the heart, lungs, and blood-vessels; morbid lesions of the liver, gall-bladder, and ducts, of the spleen, kidneys, and uterus, of the stomach and bowels. Diseases of these organs we saw in almost every case, either singly or in various combinations. Although this distinction is necessary when employed in searching for the true nature and seat of cholera, yet all the morbid appearances must be again combined in considering the dreadful mortality of the disease. In doing so now, it appears to me that the influence, whatever it may be, whether electrical, dietetical, atmospherical, or terrestrial, selects diseased subjects.

No other conclusion can be drawn from the facts I have seen. On the other hand, some of these appearances, such as ulcerations of the bowels, diseases of the kidneys, extensive diseases of the lungs and heart, and more particularly extensive diseases in the inner surface of the arteries, must be placed in pathological connexion with other circumstances, to enable us to account for the varieties of the disease, the occurrence of certain symptoms, their obstinacy, the effects of remedial agents, as well as the causes of death.

The morbid appearances peculiar to Cholera, observed in those persons who died in the collapsed stage.—The blood attracted our attention in the first dissection, and it had the same appearances to the last. It was dark coloured, and had lost much of its fluidity; this was expected, from the accounts that had previously reached us from other countries. But we were astonished to find, that it was contained in the arteries and veins, in the most minute capillary, as well as in the larger vessels; that it had the same dark colour in both sets of vessels, some of them containing a small quantity, others being enormously distended.* The capillaries and large veins

* In one case the following were the dimensions of some of the abdominal vessels: Diameter of abdominal aorta, 1 inch; above the bifurcation, $\frac{6}{10}$ths of an inch.
——— Cava, 1 inch and $\frac{3}{4}$ths.
——— Emulgent Vein, $\frac{6}{10}$ths of an inch.

on the surface of the body, contained as much blood after death as during life. On opening a vein in the dead body, the blood flowed almost as readily as it had done during life in the same person. The surface therefore retained the same dark appearance as it presented during life, and the muscles were of a dark red colour. In the act of death, or immediately afterwards, in all other diseases, the blood leaves the capillaries, recedes from the surface, and collects in the heart and large veins near it; the arterial system is generally quite empty, but occasionally a little blood is found in the aorta. Here are at once observed three remarkable facts: 1*st*, An alteration in the appearance and consistence of the vital fluid; 2*d*, A change in its distribution; 3*d*, Blood can be drawn from a vein almost as readily after death as during life; and the important circumstance may be noticed, that there was an appearance everywhere of abundance of blood. Every incision that was made, even in parts not depending, occasioned a flow of blood, so as often to be troublesome, by impeding our examinations. Some thought the blood oily.

In the Head.—Great vascularity was observed on the surface of the brain and in the membranes;—not only were the capillaries injected, but the trunks of both arteries and veins were filled with blood,—the vertebrals, carotids, and circle of Willis, as well as the vena Galeni, and the longitudinal and lateral sinuses. In the longitudinal and lateral sinuses, however, the blood was not always in a semi-fluid state, but often coagulated, and sometimes there was a fibrinous clot extending through the course of the sinuses of the brain into the jugular veins. This appearance of fibrin was observed also in those who died in the consecutive fever. On the lateral surfaces of the hemispheres of the brain, we frequently observed an extensive ecchymotic patch; sometimes there were several patches of this kind. This appearance was produced by an effusion of bloody serum between the arachnoid and pia mater. The injection on the surface of the brain was more florid than that in any other part of the body. The ecchymotic spot occupied in some cases only about an inch and a half in length; in others it was very extensive, involving the whole of the hemispheres, and occasionally extending down between them.

The vessels of the pia mater, the velum interpositum, the plexus choroides, and the lining membrane of the ventricles, were injected. The surface of the fourth ventricle, in general so white, was seen vascular, occasionally slightly stained with blood. The ventricles, whenever they were examined with a view of ascertaining the point, were found to contain a considerable, sometimes a large quantity of serum. Sections of the brain displayed the cortical substance much darker than usual, and the brain generally exceedingly vascular. As soon as a section was made there immediately appeared numerous large drops of blood, in size and number much greater than is observed in other diseases, even in active inflammation of the brain. In above one hundred and fifty cases, the spinal marrow and its membranes were minutely examined. In all, there was a very considerable quantity of serum, the membranes highly injected, the rachidian veins gorged with dark-coloured blood, and the substance of the spinal marrow, in a few cases, appeared a little softer in texture than natural. In a large number of subjects, there were ossific depositions, in the form of scales, seen on the arachnoid surface; occasionally they were very numerous and large.

The general practice was, to place the subject on the face as soon as death occurred, with a view of preventing engorgement of the spinal marrow and brain, from depending position.

In the Thorax.—The lungs were found gorged with dark viscid, oily-looking blood; they were heavier than natural, in some instances weighing 3lb. 9 oz.* Pleura minutely injected; in those who died rapidly, both the pleura and pericardium had a dry appearance; in other cases the pleura had an unctuous feel, also the serous surface of the pericardium and heart. Ecchymotic spots, of the form and size of petechiæ, were frequently seen on the pleura costalis and pulmonalis, extending in many instances a line or two into the sub-

* This subject was a male. The smallest weight in a male aged 33, tall and well proportioned, was 1 lb. 1 oz.; and in a female aged 38, it was the same.

stance of the lungs. Occasionally, in those who died in this stage, there were seen one, or perhaps two, small portions of the lung indurated, and stained of a dark-red colour, presenting all the characteristics of "*pulmonary apoplexy*;" this appearance, however, was more frequent in those who died in the consecutive fever. The bronchial membrane was injected, the tubes occasionally gorged with mucus, of various degrees of tenacity and tinges of colour.

The surface of the heart, and large vessels, very vascular, presenting many ecchymotic spots, more particularly on the acute margin of the right ventricle, and the aorta. In many instances, these were found to extend deep into the subjacent tissue. On making sections, to display the cavities of the heart, the left ventricle was almost invariably found in the state of *hypertrophy*, with diminution of the cavity, and generally empty. In the right auricle and ventricle, there was found a fibrinous clot, sometimes white, like coagulable lymph, at others stained with blood, consisting partly of lymph and coagulated blood of a dark colour. When a mass of lymph was found in the right auricle and ventricle, it invariably extended into the pulmonary artery, and in many cases could be traced into the smallest ramifications; and sometimes the pulmonary veins had a similar plug. On several occasions, the auriculo-ventricular opening was closed by the plug, prolongations from which were found interlacing between the columnæ carneæ and cordæ tendineæ.

In the inner surface of the aorta, and in a few cases in the pulmonary artery also, there was seen a distinct false membrane, completely covering the inner membrane, and extending into the vessels that are given off from it; this membrane did not always seem to be of recent date, but in many of the dissections it was observed in an incipient state. It was most completely formed near the heart; and on some occasions it was seen below the arch of the aorta, in the act of forming, presenting an appearance like tenacious mucilage, continuous with the portion already organized. Occasionally it was tinged of a dark, sometimes of a bright red colour, but generally it was white, and easily separated from the proper lining membrane, even with the handle of the scalpel. In the few

cases in which it was found in the pulmonary artery, it was thinner, and not so completely organized. In the aorta, we frequently traced it to the bifurcation of the iliacs; sometimes half-way from the heart, perfectly organized, the rest being in a gelatinous state. When separated, the proper shining smooth character of the inner membrane was seen beyond all doubt, except at parts where there were artheromatous depositions, which were sometimes confined to the false membrane, at others extended into the proper coats of the artery.

We carefully removed the contents of the thorax, not only with a view of submitting them to minute examination, but also to investigate into the condition of certain nerves and ganglions. I shall now shew the state in which we found the pneumo-gastrics, phrenics, splanchnics, and semi-lunar ganglia. The dissection of the neck shewed minute injection of the large vessels, both sets containing dark-coloured blood, more particularly the veins, which were often not only full but distended.

The pneumo-gastric nerve was frequently seen stained of a dark-red colour, through its whole course in the neck and thorax. Sometimes there was merely vascularity on its surface, till it crossed over the subclavian artery, where, in many cases, it was enlarged, so as to resemble a ganglion. This enlargement was always tinged of a bright purple colour, and existed on the right side only But the nerve was frequently similarly tinged at this point through its whole substance, when there was no enlargement. On tracing these nerves onward in their course, they frequently presented a red appearance.

The phrenics, as they passed over the pericardium, were observed to partake of the general injection; and when the pericardium presented a half-dried appearance, these nerves were similarly affected.

In a great many cases, we carefully traced the splanchnics on both sides of the spine, to the semilunar ganglia. In this part of the thorax, there was minute injection of the vessels, and ecchymotic specks, like petechiæ. These nerves were implicated in the injection on their surface, but in two subjects only was there any discolouration or other mark of disease in the substance. In one or two cases, it was thought

the ganglia were somewhat changed from the natural colour, but we discovered our error, having had, at that period, several opportunities of examining these ganglia in persons who died of other diseases, when a similar appearance was seen.

Abdominal Organs.—In the stomach, in two or three cases, we found a considerable quantity of undigested food that had been eaten a few hours before the attack, and on one occasion, a number of small stones, pieces of slate and tiles. In some cases, there was considerable injection of the peritoneal surface of the viscera, but this was by no means frequent. The stomach was in general contracted, sometimes remarkably so, and several times divided, by contraction in the centre, into two cavities. The intestines contained more or less of a matter similar to that vomited during life. Unless the patient lingered long in the second stage, no appearance of bile was seen in the bowels. The mucous membrane of the stomach was occasionally, but not always, vascular; sometimes quite white, but almost always much softer than natural, and in many cases thickened and quite pulpy, so as to be removed with the slightest touch of the handle of the scalpel. The mucous membrane of the intestines was in general more vascular than that of the stomach, sometimes more minutely injected than if size and vermilion had been thrown into the vessels. Occasionally there was ecchymosis, and frequently softening of the mucous membrane, sometimes ulceration, particularly in the ileum and colon. The mucous follicles were generally enlarged, and Peyer's patches, so rarely seen in adult age, were seldom wanting; they were large, elevated, soft and spongy, and sometimes slightly ulcerated. In many cases, we found the colon, and sometimes the ileum, thickened, the mucous membrane soft, dark-coloured, and disorganized, as in some of the worst forms of dysentery.

The liver was frequently diseased, and the disease not of recent date. Occasionally this organ was very vascular, and we rarely missed seeing sufficient quantity of bile in the pori. In two instances only were there such appearances of engorgement as are described by the India writers.

The gall-bladder was in every instance filled, sometimes distended, with dark-coloured and somewhat viscid bile, the organ

itself being very vascular, and in many cases containing gall-stones. In no instance, save one, did we discover any impediment in the passage of bile through the ducts into the duodenum. In that solitary instance, a spherical-shaped calculus obstructed the passage.

The kidneys were generally diseased. The disorganization described by Dr Bright, was very frequently met with. The vessels of these organs were almost uniformly highly injected,—a puriform fluid was always found in the papillæ.

The bladder was always contracted, so as to be as small and dense as a virgin-uterus.

The following appearances were found in the bodies of those who died in the Third Stage.—Marks of inflammatory action in the membranes, and more rarely in the substance of the brain. In almost every case the vessels ramifying in the membranes were injected; there were traces of ecchymotic patches and turbid effusion between the arachnoid and pia mater, as well as in the ventricles. In many cases we found the fibrinous plug, formerly mentioned, in the sinuses adhering to the sides of the vessels. In several cases, inflammatory disorganization was seen in the substance of the brain; sometimes the white ramollissement or liquefaction of the septum lucidum and walls of the ventricles, and in two or three cases the red ramollissement and destruction of considerable portions of the brain. It must be confessed, however, that in a few cases the brain was to all appearance sound. The traces of bronchitis, pneumonia, pleuritis, and pericarditis, were frequently observed too decidedly marked to be mistaken; such are to be expected from the injected and ecchymosed condition of these parts in the previous stage. We frequently found the fibrinous plug in the right side of the heart, extending into the pulmonary artery; it was generally more dense than in the second stage. I never saw so many examples of inflammation of the tissue of the lungs, as in the dissection of persons who died in the third stage of cholera. In the abdomen, traces of inflammation of the peritoneum were also discovered. The mucous membrane of the stomach, bowels, lungs, and kidneys, presented similar appearances to those noticed in the second stage. Feculent or bilious matter was always met with

in the intestinal tube, and frequently urine in the bladder; sometimes the latter organ was much distended. The coats of the gall-bladder were still highly injected; the organ itself, instead of bile, now contained a serous fluid, having a yellowish or greenish tinge. If the person lived some days in the third stage, the state of the blood, and its distribution, more and more resembled the appearances seen after death from other diseases.

Pathological Considerations respecting Asiatic Cholera.—After having reflected on the morbid appearances seen in the first twenty cases that occurred, and having compared these with the phenomena of the disease in its different stages, and contrasted them with the symptoms, terminations, and morbid appearances observed in other complaints, I began to suspect the correctness of the opinion promulgated by the medical men in India, at different times since 1817. Every hour's experience strengthened a belief, that their views were unfounded and erroneous. The general belief is, that cholera (however produced and propagated,) affords the best example of a disease consisting of a loss of balance in the circulation, and consequent accumulation of blood in internal organs;—that death is occasioned by stagnation of the blood, and the impossibility of creating re-action. This view of the nature of the disease seemed to receive support from the following circumstances:

1*st*, The difficulty in procuring a flow of blood on opening a vein or artery; the slow motion of the blood, its dark appearance, and its imperfect coagulation. These are circumstances frequently observed in intermittent and other fevers.

2*d*, The success of V. S. when employed early in the disease in India, made practitioners conclude, that the practice of V. S. operated by unloading the internal organs of the accumulation of blood that oppressed their action, and restored the balance of the circulation.

3*d*, The phenomena in the third stage appeared to support the analogy between cholera and those forms of fever preceded by a cold stage.

The following facts appear to me to disprove these views in a satisfactory manner.

1*st*, The absence of rigors. I have not seen any practi-

tioner who stated that he had ever observed this phenomenon in cholera. The absence of rigors struck my mind early in the epidemic, as a remarkable circumstance, distinguishing cholera from all other diseases, but more particularly those characterized by a decided loss of balance of the circulation, and accumulation of blood in some internal organ or organs.

2*d*, Every individual remedy, which in the other forms of disease connected with loss of balance of the circulation occasions remarkable mitigation of suffering, produces discomfort, and even pain, in cholera.

Thus, in cholera, hot applications and drinks are dreaded, which in the cold stage of other diseases are urgently and importunately demanded. In the cold stage of intermittent, for example, there is a demand for warm drinks and hot applications; in cholera, for cold.

3*d*, The full state of the blood-vessels on the surface of the body in cholera, after death as well as during life, contrasted with their empty condition, particularly after death, in all other diseases.

What persons were most frequently attacked?—The answer to this query has been already given, and is now a matter of history. The weakly, particularly those who are liable to complaints in the stomach and bowels, and who are subject to diarrhœa. The destitute, who can neither command proper food nor raiment. *And above all*, the dissipated, particularly those who are addicted to the habitual use of ardent spirits.

The condition of the blood is very remarkable, and has attracted the attention of the most superficial inquirer. Even without the assistance of chemical analysis, it is quite evident that the blood is thick, tenacious, dark in colour, and has an oily appearance, flows with difficulty from vein or artery, and coagulates imperfectly. But by the analysis of different chemists, it is established that the serous part of the blood, the salts and the albumen which the serum holds in solution, are found deficient to a great extent. These experiments differ in minute results, but the broad fact is as above stated.

This thick blood, after finding its way into the arterial capillaries, cannot easily escape, owing to its viscidity. This

is one cause of the slow motion of the blood. In many parts these small vessels give way, and ecchymosis is the consequence. This appearance has been seen in every organ of the body.

It is not unreasonable to suppose, that the blood becomes viscid by the abstraction of the serum, and that this is effected by the copious watery discharge from the stomach and bowels. If this view be correct, it will enable us to apply the doctrines, by which Boerhaave attempted ineffectually to explain the pathology of inflammation, to Cholera Asiatica.

In reviewing the long list of morbid appearances already described, it becomes a matter of the first importance to determine accurately, if any of these lesions are peculiar to cholera. If so, can they, by a fair process of reasoning, be connected with the symptoms in the relation of cause and effect?

It has been already admitted, that a large proportion of the morbid appearances must have existed before the attack of cholera. They are brought forward as decided proofs of the previous diseased condition of the system of those attacked, acting as powerful predisposing causes of cholera, and also to assist in accounting for the fatality of the disease.

I must further state my opinion, that a number of the morbid appearances considered peculiar to cholera, are undoubtedly occasioned by the diseased condition of the blood, and cannot be considered as causes of cholera. But they are strictly connected as causes of death in the collapsed or blue stage, and of the phenomena of the third stage. They prove satisfactorily why so few made rapid recoveries, and why so many had necessarily to undergo the miseries and dangers of the consecutive fever.

Treatment of Asiatic Cholera.—No better evidence can be offered of the ignorance of the profession generally as to the nature and seat of any disease, than the number and variety of remedies that have been confidently recommended for its cure. This was never better exemplified than in the disease now under consideration.

The following long catalogue was made out at the time cholera prevailed, but it is not even pretended that all the remedies are enumerated.

Venæsection; Cupping; Dry Cupping; Arteriotomy.—Emetics of Mustard, Ipecacuanha, Antimony, and Sulphate of Copper.—Calomel; Colocynth, singly and combined; Castor Oil; Croton Oil; Jalap; Opium; Calomel and Opium; Fluid Mercury; Mercurial Frictions; Opium combined with Antimony; Opiate Confection; Colchicum; Cajeput Oil; Peppermint Oil; Capsicum; Charcoal; Camphor variously combined; Æther; Mint Tea; Spt. Ætheris Nitrici; Magnesia; Milk; Milk and Magnesia combined; Lime Water; Alkalies; Spt. Ammon. Aromat.; Dover's Powder; Ox. Bismuth.—Various Balsams.—Acetate of Lead; Nitrous Acid; Soda Water; Cold Water *ad libitum*; Water prohibited; Effervescing Draughts; Strychnia; Various Rubefacients in the shape of Frictions, Sinapisms, Embrocations.—Various Contra-Irritants,—as Blisters, Antimony Ointment, Moxas, Actual Cautery, Bastinadoing the feet! Cutting the throat! Suffocating under a feather-bed! Injections of Oxygen Gas into the bowels! The application of heat in the shape of Warm Bath, Vapour Bath, Fomentations; Dry Heat; the application of Cold.—Galvanism.—Injections of Beef Tea, Starch and Opium, Turpentine, Chamomile Tea, Hot Water, Cold Water, Strong Solution of Potassa Fusa, Tobacco, Port Wine, Alcohol, Sulphate of Copper, Acetate of Lead, &c. Stephen's Drug; Saline Injection into the Veins.

The above list would be humiliating to the whole profession, were it not remembered how much anxiety and excitement prevailed among medical men at the time, so much so, that several lost their reason, and many their lives on the occasion. Many of these remedies are totally opposite in their nature and principles of action; many of them were proposed upon erroneous principles, and many more upon no principles at all; but by far the greater number were recommended on the prevailing notion, that cholera was a disease affording the purest example of a loss of balance of the circulation, and consequent accumulation of blood in internal organs. The diarrhœa and vomiting were regarded as efforts of nature to unload the engorged vessels, and therefore formed an important part of the sanatory process.

I have already attempted to shew that this was a pathological error, and, if the views which have been given in these pages be correct, the practice must have been very prejudicial. I allude more particularly to the following remedies, —bleeding, purgatives, and emetics.

Another theory, that cholera depended on deficiency of the biliary secretion, requiring large and frequently repeated doses of mercury, has, I believe, been also prejudicial.

With respect to the advantages that may reasonably be expected from abstracting blood, I believe that venæsection may be employed in the first or premonitory stage, when it acts by checking the diarrhœa, and allaying the irritability of stomach. After collapse took place, bleeding in any form rarely proved serviceable, and was injurious in most instances in which it was employed within my observation. But it is a remedy which ought to be kept in view, to moderate febrile movement, and to extinguish local inflammations in the third stage.

Having made these brief general remarks, I shall now describe the treatment which experience at the bed-side, and morbid anatomical investigations, have led me to adopt; postponing for the present the consideration of the practice of saline injection, which it is my intention to notice in a separate article.

A patient should be treated according to the actual state in which he is found; this circumstance, therefore, leads me to consider the treatment in the different stages of the disease.

Treatment in the First Stage of Cholera.—This, it will be remembered, has been likewise termed the premonitory stage. If there be evidence of the stomach being loaded, vomiting may be induced by a copious draught of tepid water, chamomile tea, or mustard and water. The stools should be examined: if they contain hard masses of feculent matter, a mild injection may be administered, or a small dose of castor oil exhibited. But should the stools be watery, copious, more particularly should they have assumed the characteristic appearance, the diarrhœa should be immediately checked by a dose of laudanum, an opium pill combined with a small quantity of calomel, or a few grains of opium introduced into

the rectum. A warm bath should be used, and the patient afterwards put to bed. If the patient have been previously in good health, temperate in his habits, and the pulse strong, a vein may be opened, and a sufficient quantity of blood abstracted. It is in such circumstances that venæsection may be expected to be useful. I have known many individuals destroyed when in this critical state, apparently by taking a laxative, even a small quantity of calcined magnesia, or an emetic. Saline medicines should be proscribed during the continuation of a cholera epidemic, as I have seen several people sink rapidly into a fatal collapse under their operation, who had had no previous bowel complaint, but felt slight oppression, which made them wish to unload their bowels. The patient should be carefully watched, so that the heat of the body may be kept up to the natural standard by proper applications,—the discharge opportunely restrained by the employment of opiates,—and the pulse supported by the exhibition of stimuli. Digestion being in all such cases impeded, the lightest food only, such as arrow-root, should be allowed, and in small quantity at a time. It is in this stage that copious draughts of any liquid prove injurious. When patients escape from the condition just described, a slight febrile movement, symptoms denoting cerebral irritation, or considerable bodily debility, frequently follow, either singly or combined, and must be treated accordingly. Confinement to the house, great quiet, and attention to the functions of the stomach and bowels, must be enjoined for some time, as relapses are frequent, and I have known fatal collapse to take place suddenly in several cases after one or two such warnings had been neglected.

Treatment in the Second Stage of Cholera.—Although I have known V. S. employed advantageously, and strong purgatives used, without producing death in this stage of the disease, I cannot state the fact too strongly, that they are dangerous remedies. In taking a retrospective view of the cases as recorded in the books of the Drummond Street Hospital, I cannot but condemn the practice which I myself had recourse to, but more particularly that which relates to the exhibition of purgatives; and were I treating the disease again, I would avoid exhibiting any remedy that would in the least degree

tend to produce one additional alvine evacuation, or irritate the stomach.

Rubefacients form another class, along with irritants, which cannot be too strongly condemned in the second stage. They were recommended upon the old view of producing a flow of blood to the surface, in order to relieve internal organs. Long before I knew the error of this theory, I had arrived at the conclusion, that they never do any good, while they irritate and annoy the sufferers. Much have I been pained to see moxas and the actual cautery applied. I never observed beneficial results in any case from these remedies, although the hot iron has been drawn along the spine on each side, from the occiput to the sacrum. Hand-rubbing would seem to be serviceable, by assisting the motion of the blood; and it appeared to allay the severity of the pain occasioned by cramps. Although hot applications seemed to create uneasiness and impatience, still I am convinced that warmth is necessary, when the temperature of the body is much reduced. Warmth appeared to mitigate the violence of cramps, if it did not prevent their recurrence. It appeared to me that dry heat was best. I therefore had tin cases constructed the length and breadth of the body, to contain the vapour of boiling water. Each tin case was open at both ends, was deposited in the centre of a loose straw bed, and covered with a folded blanket. It formed rather a hard bed, but there were few patients who could not endure it for two or three hours, and there was seldom occasion to keep them longer. After a number of experiments, I succeeded so well that I could heat a bed sufficiently in three minutes, and support the heat for any length of time, or reduce it at pleasure, by vapour from a boiler, which communicated by pipes furnished with stop-cocks, with several beds in each receiving-ward.

Cholera patients suffer from intense thirst, and their anguish always appeared greatly increased if they were restricted as to the quantity of liquid. In the Drummond Street Hospital every method was tried, viz. by restricting the quantity of liquid, by allowing a moderate quantity, or affording an unrestricted supply; and we came to the conclusion that the last was the best method.

Stimulants are necessary when the pulse and action of the heart become feeble, but should be discontinued upon the occurrence of re-action.

It has been already stated, that the discharge from the bowels should be checked as early as possible. For this purpose opium, in various shapes, has been used. Perhaps the best method is to give repeated small doses by the mouth, or to introduce an opiate suppository into the rectum. The acetate of lead and sulphate of copper have been used for this purpose, but not with good effect. I was induced to employ strychnia as an astringent, and began with doses of 1-12th of a grain; we gradually increased the quantity to 1 grain, repeated according to circumstances, every hour, or second hour. We thought good effects were produced; and in one or two instances only, did spasmodic twitches or other unpleasant symptoms arise, although this powerful remedy was pushed to considerable extent. It appeared to act by not only restraining the discharge from the bowels, but by shortening the collapse, and rendering the re-action more permanent. I frequently wished that gentlemen who proposed new remedies, would look at the morbid appearances. If the mucous membrane of the stomach were so soft and pulpy, as to be easily separated from the subjacent coat by a touch of the handle of a scalpel, surely irritating medicines are contra-indicated? If there were great irritation, inflammation, ulceration, and an appearance of sphacelation of the large intestines, surely injections of port wine, alcohol, salt dissolved in water, and more particularly potassa fusa, were improper? In truth, from indiscreet zeal much mischief was occasioned; by doing too much, the sufferings of many a patient were greatly increased, and odium was thus brought on the profession. In the Drummond Street Hospital, we fairly tried all the remedies recommended, but observed no advantage from a large majority of them. Thus, Stephen's saline solution, which it was stated had operated like magic elsewhere, was tried and laid aside. This medicine was used for the purpose of restoring the serum of the blood; but no one who has seen the mucous membrane of the stomach and bowels in cholera subjects, can have any faith in such a remedy. It was not

found serviceable in any one case, and was injurious in many, by exciting vomiting and purging. The oxid of bismuth and nitrous acid were prescribed according to the directions received; but we never could discover any advantage from their use, although they were less injurious than most of the other remedies.

Treatment of the Third Stage of Cholera.—It has been already stated, that as soon as the stage of collapse begins to give way to re-action, stimulants should be diminished, and ultimately omitted entirely. Looking at the vascular engorgement of the capillary vessels in every organ in the body, together with the ecchymotic spots, so frequently discovered on dissection, there is nothing very encouraging to support us in any plan of treatment. But we must recollect that recoveries do take place, and that there are no limits to the efforts of nature when she is in difficulties; and that the chances of recovery are greatly increased, if we are acquainted with the morbid condition of vital organs, and know the kind of assistance that ought to be afforded. My impression is, that we do not trust to nature sufficiently in the early part of this stage; that we have always been too anxious to increase the force of the circulation, and in too great haste to produce feculent evacuations, and a copious flow of urine. By erring in this respect, irritability of stomach is created, and when this is once established it is very intractable. I know of no remedy which can restrain the violent bilious vomiting except extensive leeching, and irritating the surface of the abdomen. I have seen much benefit produced by V. S. in this stage, as also from repeated applications of leeches to relieve the brain, lungs, heart, and organs in the abdomen, when oppressed with too much blood, or inflamed. Often have I had to deplore my own timidity upon finding lymphy effusion, the undoubted product of inflammation, in all the cavities after death. But notwithstanding these remarks, it cannot be denied, that great discrimination and experience are required in investigating the physiological and pathological condition of each patient. If there be cerebral disturbance, it must be treated on ordinary principles. The symptoms are generally vertigo, lethargy, or coma. We must keep in recollection the vascular state in which the brain and

its membranes are left at the termination of the stage of collapse; the ecchymotic patches produced by effusion of a bloody serum, between the membranes, and the plug or coagulum, found in the great venous channels. We may do a great deal by shaving the head, and keeping it cool, by frequent cupping, or application of leeches. Subsequently, the application of antimony ointment to the head, to produce long-continued irritation, was found very beneficial. The use of opium in this stage is to be suspended. I have seen it employed by itself, and conjoined with calomel, to restrain the bilious vomiting, but without effect.

In this stage we frequently pushed mercurial preparations to considerable extent, both internally and by means of inunction, so as to affect the system speedily. I cannot say they did harm in every case, but they often did mischief, and I was never sensible of any good effects.

In this stage blisters and other contra-irritants are serviceable; keeping the morbid appearances in view, I scarcely think we were active enough in this respect.

If the bowels are not moved sufficiently, the most gentle and unirritating laxatives, such as rhubarb, should be used. If the urine be scanty, particularly if there be pain in the region of the bladder or glans, draughts composed of camphor mixture, with a few drops of laudanum, and a little sweet spirit of nitre, may be useful. It is adviseable in some cases to introduce the catheter, which often allays irritation. I have seen large collections of urine in this stage, when not suspected.

Many persons died in the course of the consecutive fever, from pneumonia, pleuritis, pericarditis, peritonitis, but still more from bronchitis. This is to be expected from the morbid appearances found in those who died in the previous stage. Many persons died of old organic diseases of every organ, but more particularly of the lungs; as long standing chronic bronchitis; chronic, calcareous, and tubercular degenerations, and emphysema of the lungs; together with diseases of the heart; aneurisms, and other diseases of the arteries.

Treatment of Asiatic Cholera, by injection of Saline Solution into the veins.—That there is a deficiency of serum in the

blood in cholera patients, was soon suspected; and the point having been well established by chemical analysis, the attention of practitioners was directed to discover the cause of the deficiency, and means were employed to restore the loss.

I have no doubt of the correctness of this view, which appears to be proved by the following facts. 1st, When artificial serum has been added by injection, and mixed with the circulating blood, the bad symptoms have vanished, and every appearance of health has been restored. (Vide page 367.)

2d, Blood drawn from the system after the saline injection, generally presented the natural appearance.

3d, Unfavourable symptoms have frequently returned with all the horrors of collapse, after copious discharge of similar fluid from the stomach and bowels; and again and again has the system been restored by venous injection, and the patients ultimately saved.

The bold idea of restoring the loss at once, by injecting a large quantity of saline solution into the venous system, occurred to the original mind of the late Dr Latta of Leith, who by his unwearied and unremitting exertions on this occasion, contracted bad health, and died soon afterwards of consumption.* He was ably and zealously supported in his investigations by Dr Lewins, who encouraged and assisted him, when others threw every obstacle in the way of his experiments, and too often gave erroneous reports of his practice.

When first informed of what Dr Latta had done, my mind became terrified at the contemplation of all the evil consequences which might result from such extraordinary means. The danger of air finding its way into the vascular system, the rupture of blood-vessels, dropsy, and the fatal effects of inflammation of veins, made me, as I have no doubt it did others, regard the cure as worse than the disease. I was anxiously urged to try the practice; but I resisted until Drs Latta and Lewins afforded me an opportunity of examining the body of a woman who had been injected. After a very

* Although Dr Latta's exertions and fate must have been well known to a number of influential men, his grave does not exhibit any monument of public gratitude, nor have his orphan children received any offer of support or protection!

minute and careful examination, I could discern no rupture of blood-vessels,—no effusion of liquid into the cavities or the cellular tissue. In fact, I could see no appearance that was not usually seen in other victims of cholera, when the ordinary treatment had been pursued.

I was too old to be led away by any very extraordinary expectations of the results of this practice; and in order that we might err on the safe side, it was determined, after deliberate consultation with my kind friend and able colleague Mr Meikle, that no one should be operated upon in this manner till every other means had been tried in vain, till the collapse was extreme, and the patient appeared to be in the very jaws of death. While this will be admitted to be the prudent course we were bound to pursue, it will be allowed it was not calculated to give the practice the best chance of success. On the contrary, in looking over the cases, my only surprise now is, that one of the individuals recovered by any means that human ingenuity could suggest.

The substances injected were in the following proportions: Muriate of soda, ℥ss.; bi-carbonate of soda, ℈iv.; water, lb. x.* The temperature was from 106° to 120°. The solution was carefully strained twice through leather. The salts must not be carelessly thrown into very hot water, and subsequently cooled, as we found that water at a high temperature gradually decomposed the salts, and the solution remained turbid. The good effects of the injection were rapid in proportion to the heat of the solution, but patients could not bear a higher temperature than that above mentioned. The precautions necessary in making and using the injection are of vital importance. If solid saline matter be thrown into the circulation, death in all probability must inevitably ensue. If the solution be strained through linen, or a towel, no precaution will prevent minute portions of flaky threads from intermingling; should even one such portion be injected, recovery can scarcely be expected. I need not speak

* We commenced this treatment on the 12th May 1832; the solution was made in the proportions above stated till 21st August, after which the quantity of each of the salts was doubled.

of the danger of injecting air; but I may relate what happened in the Drummond Street Hospital with respect to the tubes. Reid's syringe was the instrument employed, with connecting tubes; every precaution was taken to have the valves of the syringe in good order, and the tubes air-tight. At one period of our operations, twenty-nine cases of death took place consecutively, without a single recovery;—this happened after we had had eight recoveries out of thirty-four cases. The result alarmed us, and we entered into an anxious investigation to discover the cause of such fatality, and in the end we suspected a faulty state of the tubes; they were cut open, and we had the mortification to discover the spiral wire corroded, with scales separating, and others hanging loose. There can be no doubt that many of these minute portions of oxidized metal had passed into the system with the injection. I had a conical-shaped tin vessel for containing the solution, fitted with a cover; the temperature, ascertained by a good thermometer, was supported by placing this vessel in a large tin basin containing hot water. In order to prevent the lodgment of particles of dust, a deal box was made to hold the apparatus. To shew the necessity of carefully straining the solution, it may be stated, that at the second straining, nearly a tea spoonful of saline matter has been collected from the leather strainer. At first we used linen, or a clean towel, as a strainer; and I have reason to suspect that some of the deaths may be attributed to the circumstance mentioned above.

The operation should be performed by two persons; one to open the vein, introduce the tube, and keep it in position; the other to take charge of the fluid to be injected, and the apparatus. It is necessary to have an assistant at hand to do any thing that may be required, so that the attention of the operators may be entirely devoted to the parts they have to act. The position of the operators is a matter of some consequence, as the operation will occupy fully half an hour; the person whose duty it is to open the vein, should be comfortably seated on the side of the bed corresponding to the arm on which he is to operate; the other should be seated across a form, or narrow table, with the vessel placed between his legs. His first duty is to pump the fluid

through the tubes for a few minutes, in order to get rid of any air that may be attached to any part of the syringe, or sides of the tubes,—the extremity of the tube being kept under the surface of the liquid. When the vein has been opened, and the nosle introduced, the operator is to keep it in its place with the finger and thumb of the left hand, and take hold of the extremity of the tube with the right; he is to place his index-finger to stop the mouth of the tube, it being still under the surface, while the other operator gently pushes the piston down,—this is to satisfy him that it is full; he then directs the point towards the nosle, which, if not filled with blood, ought to be filled with the injection before the tube is finally connected with it. All this, to insure success, must be quickly and dexterously done. Upon a signal given by the first operator, the other is to commence pumping, being careful to hold the syringe perpendicularly, and never take his eye from the vessel, or direct his attention to any other matter. The whole of the fluid, consisting of ten pounds, may be with safety introduced in thirty minutes; in which time we may reasonably suppose the blood will have performed the circulation several times, and the injection been mixed in a very gradual manner with the vital fluid. All danger of over-loading the system suddenly, and rupturing vessels, is in this manner avoided.

It was wonderful to witness the effects speedily produced by the injection. These I shall now state under the following heads:—

1*st*, On the pulse.
2*d*, On the cramps.
3*d*, On the temperature of the body.
4*th*, On the respiration and voice.
5*th*, On the expression of countenance.
6*th*, On the restlessness, and other uneasy feelings.
7*th*, On the thirst.
8*th*, On the secretion of urine.
9*th*, On the period of death.

1*st*, *On the Pulse.*—It is remarkable how speedily the injection affects the pulse, making it perceptible after it had ceased to be felt at the wrist. By the time four ounces were introduced, the pulse could generally be distinctly count-

Haec sunt praecipua argumenta quae in hâc controversiâ prolata sunt. Quum vero in hujusmodi quaestione factis contraria facta a clarissimis viris confirmata, in utrâque parte reperiamus, veritatem ab utrâque participari verisimillimum est. Itaque dubitare non possum quin multi cum CHAUSSIER et ADELON consentiant, et nec JOANNI HUNTER venas nihil absorbere concedant, neque cum MAGENDIE, *Hunterianas* opiniones de absorbendi functione in lymphiferis vasis insita rejiciant. Hîc tamen quaestio proponenda est.

Si natura duobus vasorum ordinibus absorbendi functionem concessit, num haec vasa in varias materias aequè agunt? Sin aliter, quasnam leges sequuntur, et quid his, quidve illis absorberi debet? Experimenta supra narrata, venas et lymphifera vasa in diversas, potius quam in easdem materias agere, probare videntur.

In sequentibus paginis secunda quaestionis pars consideranda est.

Quae proprietates materias ut Venis, et quae ut Lymphiferis Vasis absorbeantur, aptas reddunt?

HAEC quaestio, ut opinor, nondum satis Physiologorum studium in se convertit. Jamjam supra memoravimus MAGENDIE nil nisi chylum, seu cibi portionem ad nutritionem aptam, chyliferis vasis absorberi, caeterasque res cunctas, quae in corpus intrare possunt, venarum iter sequi existimare. Atque huic opinioni congruere videntur consequentiae, quas ex suis experimentis TIEDMANN et GMELIN inferunt. Verùm enimvero si res ita sese habere conceditur, quod tamen etiamnum in dubium revocare licet, quaestio jam proposita non ideo minus responsionem flagitabit. Parum enim constat, cur aliquid, ob usum cui post nonnullas mutationes inserviturum sit, ex officio istos aditus aliis materiis negatos ingredi sinatur, nisi speciem quandam, et naturam singularem, etiam in limine, prae se ferat. Praetereà, quamobrem natura, id quod nutrire possit a non nutriente tantâ industriâ sejungeret, et paulo postea in venis conjungeret, et cordis contractionibus apprimè inter se commisceret?

Res profectò difficultatibus scatet, et non sine diffidentiâ

meam opinionem propono: Scilicet acida, et quae inter acida quodammodo referri possunt absorberi venis, alkalina vero, et his cognata lymphiferis vasis esse commissa. Hanc conjecturam in trimestri libello ad res medicas et chirurgicas spectante, hâc in urbe à Doctore DUNCAN juniore, clarissimo Professore edito, jam olim breviter protuli, et quanquam multa experimenta instituere necesse sit, priusquam pro certo haberi possit, tamen fortasse non omnino indigna aestimabitur, quae hîc paulo fusiùs tractetur. Incipiam ab argumentis, quae, ut opinor, res alkalinas chyliferis et lymphiferis vasis absorberi indicant.

Quanquam chylus pro ratione cibi multùm compositione variet, ut bene demonstravit MARCET, chemici omnes, licet aliter de eo inter se discrepantes ei certè facultates alkalinas, tanquam uno ore, tribuerunt.

In hôc enim consentiunt VAUQUELIN, MARCET, BERZELIUS, BRANDE, et alii. Experimenta Professorum TIEDMANN et GMELIN ad eandem conclusionem spectant. In plurimis exemplis vires alkalinas in chylo observaverunt, nec aliter res sese habuit dum tota intestini canalis acidas materias contineret. At forsan aliquis mihi objiciet, ea experimenta esse vitiata, miris materiarum farraginibus, quas infelices bestiae devorare coactae sunt. Talem quidem conjecturam mihi in mentem venisse confiteor. Sequens igitur experimentum institui. Cuniculum, qui paulo antea rumicis acetosae folia, materiam certè nullis contradictionibus obnoxiam, devoraverat, vivum incidi.

Chylifera vasa humore leviter albido, et lac valde dilutum referente, atque manifestas proprietates alkalinas habente implebantur. Semicoctae tamen materiae, quibus intestina distendebantur, proprietates acidas non minus conspicuas praebebant. Sapor etiam rumicis, et odor quoque aliquatenus manebant.

Lympham vero alkalinas facultates habere non tam bene observatum est. BRANDE declarat illam nec ut alkali, neque ut acidum agere. TIEDMANN autem et GMELIN alkalinas proprietates uno quidèm experimento notaverunt.

Ipse quoque in ovibus nuperrimè occisis exploravi lympham, cujus contactu rocellam acidis rubefactum, caeruleum colorem accipere vidi. Neminem latet vasa absorbentia conspicua fieri glandulasque affici, in illis qui variolae succumbunt. Humorem itaque ex variolarum pustulis examinavi, et alkali facillimè agnovi. Item in quodam

homine, cui vesicatorium pectori ulcus induxerat, ex quo glandulae axillares doluerunt et tumefactae sunt, lympha, quâ ulcus madefactum est, fuit manifestè alkalina. Praetereà glandularum tumor et dolor, subacidâ lotione ulceri admotâ, citò levati sunt. Non tamen inde opinor, glandulas ab alkali fuisse exasperatas, sed potiùs virus in eo solutum aptiùs fuisse factum ut vasis lymphiferis absorberetur.

MAGENDIE contra absorptionem per lymphifera vasa objicit, glandulas interdum, punctiunculâ novâ et incontaminatâ acu factâ, tumescere. Hoc vero mihi nugatorium videtur, ipsa enim inflammatio a vulnere orta materiam gignit, quae absorpta glandulas afficit, et parum dubito quin ea, sicut permultae aliae materiae in corpore productae, proprietates alkalinas habeat.

Meâ theoriâ de lymphiferorum vasorum actione admissâ, experimenta quae magno effectu contra horum vasorum absorbendi facultatem MAGENDIE protulit, facilè ita explicantur, ut magnâ ex parte vim amittant. Strichnia, picrotoxia, brucia, et alia principia vegetabilium venenorum, licet quibusdam alkalinis proprietatibus polleant, pene insolubilia sunt, itaque, ut docet ORFILA, parum agunt nisi cum acidis conjuncta. Quinetiam in veneficis istis medicamentis cum acido superante existunt, et inde, ni fallor, idonea fiunt quae venis absorbeantur. Barytas fortasse est solum venenum alkalinum in aquâ dissolubile, experimentis vero nequaquam idonea videtur, 1*mo*, Quòd neque haec valde dissolubilis est. 2*do*, Quòd propter vehementes attractiones chemicas, cum aliis rebus protinùs conjungitur, et novas proprietates acquirit. 3*tio*, Quòd cum antea dictis venenis comparari non potest, quia licet genus nervosum manifestè afficiat, tamen inter acria et caustica venena potius quàm torpefacientia recensenda est, et ubi partes erosae sunt, contradicendi occasio deesse non potest. In processu quo chymus formatur, materiae colorantes separantur, ut benè demonstravit MAGENDIE; itaque non miror eas in chylo non fuisse inventas, praesertim si, tanquam indicum, in acidis potius quam alkalinis humoribus solvendae sunt.

Bilis autem, humor naturâ flavus et idem alkalinus, ut supra diximus, vasis lymphiferis absorbetur, quod porrò confirmant SOEMMERING et DESGENETTES.

Nonne ex lymphiferorum vasorum actione, quam nunc propono, pendet ea strumae curatio a BRANDISH et aliis

laudata, in quâ potassa pura, caeteraeque praeparationes alkalinae usurpantur. Quidam sales medii cum lymphiferis vasis, tum venis absorberi posse videntur; hujusmodi sunt murias sodae, sulphas potassae, etc.: in multis aliis res non ita se habet. Operae pretium foret de his salibus investigationem specialem inire. Non oblitus sum HALLERUM acidas proprietates chylo tribuisse; dicit enim: "Utilitas chyli proxima est, putrescibilem naturam sanguinis, acido succo suppeditato, contemperare." At cùm ipse confiteatur chylum nullo rubore succum heliotropii tingere, et ad pinguitudinem acorem obvolventem confugere cogatur, Cl. viri opinio hâc in re nullam vim habet. Parùm dubito quin a nonnullis physiologis multa meae opinioni objiciantur: quaedam tamen dicenda sunt, quae forsitan nonnullas contradictiones avertent. Nondum nervorum actionem cum absorbentium vasorum functionibus conjunctam, physiologi satis exploraverunt. Ex hâc tamen conjunctione, chemicae mutationes vitae peculiares magnâ ex parte pendent. Sequentes notationes ab hàc re non omnino alienae sunt. Anno proximè elapso, lympham in equo ad feras in horto regio Parisiensi alendas occiso examinavi. Contra expectationem hanc lympham acidam esse inveni. Non leviter attonitus, mihimet ipse exclamavi; actum est de theoriâ meâ. Rem tamen in animo perpendens, hanc exceptionem tempori, quod inter equi necem, et lymphae tentamentum elapsum erat, attribui. Crassum intestinum aquâ cum concocto foeno commistâ, et ex eo colore subviridè fusco tinctâ, plenum erat. Vasa lymphifera ex hâc parte intestini progredientia, humorem acidum, ut supra dixi, continebant, qui, licet translucidus, et multo dilutior, ab humore in intestino, colore non valdè differebat. Strenuus HUNTERI fautor hîc sine dubio diceret, lympham ex intestino colorem accepisse. Hoc tamen, licet probabile, ego non assero. Hâc notione de mutatâ post mortem actione perculsus, experimenta JOANNIS HUNTER accuratius examinavi, et fateor me cum opinione MAGENDIE de celeberrimo illo viro consentire non posse. HUNTERUM enim etiam ex istis illius experimentis, quae ad absorbendi functionem pertinent, peritissimum, eundemque vitae parcissimum existimandum duco. Lubentissimè concedo HUNTERUM absorbendi functionis scientiam imperfectam liquisse. Si ille omnia fecisset, MAGENDIE gloria minor fuisset. Quis autem imperitus, inciso animalis abdomine, vità perstante, octo difficilia ex-

experimenta instituere potuisset? et quis nisi vitae parcus fuisset, non potiùs octo animalia ita incidisset? In primo experimento nervi ligati fuisse videntur. Itaque haud miror lac fuisse absorptum, quia, ut in mortuo animali, actio nervorum defuit. MAGENDIE humorem in chyliferis vasis repertum chylum fuisse contendit. At nequaquam dubito quin physiologus ille sapiens ab hâc opinione decedat, cùm consideraverit. 1*mo*, Lac nec humori gastrico, neque pancreatico fuisse subjectum, neque cum bile commistum. 2*do*, Lac injectum fuisse in eam partem inferiorem intestini, in quâ, ut testatus est HUNTER, chylus deerat. In alio animali nervi fuisse intacti videntur, et, ut HUNTERUS ipse agnovit, lacteus humor in lymphifera vasa non penetravit licet lac in intestinum injectum esset. Indicum, aeque ac lac, ligatis nervis absorptum fuisse videtur.

HALLERI et quorundam aliorum physiologorum experimenta non adeo enucleatè narrantur, ut dici possit utrum meae opinioni faveant, an repugnent. Unum nihilominus inter Professorum TIEDMANN et GMELIN experimenta, hìc non reticendum est.

Acetas plumbi et tinctura rhei cani data sunt et, occisa bestia, rheum, quod fieri non solet, in chylo repertum est, plumbum quoque in chylo aderat. Praetereà hic humor aut medius (neutral) aut etiam acidus videbatur, quia necesse fuit alkali addere ut rheum conspicuum fieret. Ex quo conjicio plumbum, quod paralysin inducere solet, in nervos agere, et absorbendi funcionem perturbare posse. Chylus alkali carens hujus plumbi effectûs optimum indicium videtur; nam ubi ob minorem plumbi quantitatem hic effectus non productus est, et materiae colorantes non absorptae sunt, chylus solitâ ratione alkalinas proprietates habuit. Non possum non credere, discrepantiam, quam supra inter quosdam egregios Physiologos existere notavi, ex hac mutatâ vasorum absorbentium actione praecipuè pendere.

Modo paulisper venas inspiciamus, et consideremus quantum in hâc parte conjectura mea factis nitatur. Quod si vasorum, quae absorbentia nuncupantur, actio obscura est, et explicatu difficilis, multò venarum difficilior. Cùm venarum officium evidentissimum sit, sanguinem, jam ad extremas arterias perventum, non nihil mutatum ad cor reportare, necesse est ut minùs evidentis officii, absorbendi scilicet, effectus difficiliùs assequamur, et necessariò simplices nunquam contemplari possimus. Praeterea, licet

permulti sanguini operam dederint, discrimen sanguinem arteriosum inter et venosum nondum satis prolatum est. Admissâ theoriae meae parte priore, ad vasa lymphifera spectante, haec secunda ratione quodammodo indicari videtur. Nam si lymphifera vasa partes alkalinas absorbent, etiam si chymus medius antea fuerat, et a fortiori si acidus, necesse est ut reliquum acidum fiat. At magna pars hujus, quodcunque sit, reliqui, venis absorberi videtur*, et intestini finem versus acor plerumque deest.

Haec autem ratiocinatio, factorum confimatione non omnino caret. Anthonius Todd Tompson, dùm acidi oxalici in cuniculos effectus exploraret, acidum in sanguine venoso invenit. Hoc quoque ab amico meo Ludovico Perey saepè observatum est. Non modo charta Lichene Rocellâ tincta rubefacta est, sed sanguis mirabilitèr nigruit. Et licet recentiora experimenta a Doctoribus Coindet et Christison instituta, cum supra dictis non omnino consentiant, meae tamen theoriae non adversantur; his enim exploratoribus acidum per absorptionem agere videbatur, et quanquam acidas proprietates in venoso sanguine detegi posse negent, mutationem sanguinis coloris effectam, ab acidi contactu procul dubio provenientem confirmant. Quae de acidorum mutatione scripsit ingeniosus Coindet, nondum legendi occasio mihi data est.

Res profècto quae maximâ curâ exploretur dignissima est, chymica enim est actio, cujus leges prolatae, etiam si causa in aeternum lateat, physiologiam necessario promovebunt.

Acidum nitromuriaticum, aeque ac oxalicum in corpore mutari videtur. Doctor Combe, cujus dissertatio de acido nitro muriatico, Regiae Societatis medicae palmâ donata est, acidum in sanguine nequaquam reperire potuit. In bestiis vero, hoc acido non aliter ac oxalico necatis, sanguis venosus niger est, at in sinistro corde majore etiam quam solitâ ratione rubet. Physiologi multum inter se de naturâ sanguinis venae portae discrepaverunt. Alii enim hunc sanguinem non solitâ ratione coire declaraverunt: hoc autem ab aliis negatur. Mihi persuasum est hanc dis-

* Reliquum strictissimâ dictione non bonum esse verbum confiteor, quippe cum venae eodem tempore, quo lymphifera vasa agant, sensus autem satis evidens est.

crepantiam, potiùs ex quâdam varietate a materiis absorptis proveniente, quam ex scriptorum fide proficisci. At bene cognitum est acida parvâ quantitate cum sanguine commista illius coitum impedire posse. Nondum novimus quomodo sanguis arteriosus in venosum mutetur, neque statum carbonii quod in hoc, majore quantitate existit. Argumenta vero non desunt, quae illud etiam in venis, tanquam acidum immaturum existere indicent, Hoc autem admodum dubium est. De principio colorante in rhei radice existente, haud multum novimus; notatu tamen dignum est, hoc principium, quod ex experimentis Everardi Home, et Professorum Tiedmann et Gmelin venis absorberi videtur, alkalinum contactum exigere, quò in sero sanguinis manifestum fiat. Indicium, meo quidem judicio, alkalinum sanguini naturale ab aliquo acido superatum fuisse. Indicum praeterea, quod acidis praecipue solvitur, venis manifestè absorbetur, etsi color postea, alkalino in sanguine existente mutatur. Ad haec, cùm oleum, fixum, ut vocatur, et alkalinis consentaneum, chyliferis vasis absorbeatur, quod cremore chylo supernante ostenditur, essentialia contra, et empyreumatica, non minus acidis convenientia, venis absorbentur. Si venae materias acidas accipiunt, nonne hoc in causâ est, cur sitientes acidulos humores appetant? Venae cum ob majorem capacitatem, tum ob faciliorem cum intestinis communicationem citiùs et copiosiùs quam chylifera vasa, humores imbibunt: Sapiens itaque natura venis aptissimae potionis desiderium sitientibus excitasse videtur.

Alkohol magnâ quantitate et omnino sine mutatione venis absorbetur. Fateor me nondum conjectare potuisse, quamobrem his vasis accipiatur, et illis rejiciatur. Ab acido tamen acetico, compositione non longè distat.

Priusquam commoda, quae ex absorptione modo supra conjecto perfectâ, oriri possunt, et quantum haec conjectura cum phaenomenis in variis functionibus apparentibus conveniat, consideremus, abs re non erit, paulisper examinare quid physiologis visum fuerit, de modo, quo variae absorptae materiae, sive in vasa chylifera, sive in venas accipiuntur.

Nonnulli existimavere pressuram intestinorum super ea quae in illis continentur, liquidas chimi partes in patula vasorum ostea adigere. Plures vero, quos inter numerandi sunt Haller et Monro secundus et tertius, materias primo per attractionem vasorum capillarium sorberi, et

postea vasorum contractionibus, valvulis adjuvantibus, promoveri.

Magendie quoque, licet in opere suo de Physiologiâ ignorantiam de hâc re confessus sit, tamen in dissertatione quam recentiùs Academiae Regiae Parisiensi subjecit, istam attractionem, tanquam absorptionis causam, admisisse videtur. Quòd si absorptio, in tali actione constaret, tum sane necesse foret, omnes humores, sine discrimine in vascula utriusque ordinis intrare. Ad hanc difficultatem vitandam, Bichat sensum, et vim contractionis organicae, ut ea nominavit, finxit.

At praeterea quod illas proprietates sensibus nostris nequaquam assequi possumus, theoria variis contradictionibus est obnoxia: Haud quaquam necessarium est hîc referre omnes difficultates de quibus alii physiologi mentionem fecerunt; sequens mihi insuperabilis videtur. Cùm illarum facultatum, quas imaginatus est Bichat, actio tota foret in rebus quibusdam accipiendis, aliisque rejiciendis, patet eas, si existerent, mechanicam tantummodò separationem esse perfecturas. Ea autem elementa, quae inter se chymicâ attractione retinentur necessariò sine mutatione manerent.

Brugmans in auxilium vocat vitam propriam in absorbentibus vasis insitam; et clarus Blumenbach, ni fallor, cum illo quodammodo consentit. At ita profectò difficultas nequaquam explicatur. Quidam inter celeberrimos nostri aevi philosophos et physiologos, Young nimirum, et Wollaston et Wilson Phillip et Prochaska in hujusmodi vitalibus actionibus, vim galvanicam multum perficere existimant. Verum enimvero si a tantis viris decedere sit juveni permissum, ego quidem fateor multas difficultates obstare, quo minus talem opinionem amplectar. Mihi quoque praematurum videtur causam mutationum chimicarum, quae in vivis corporibus perficiuntur, imaginari, priusquam phaenomena ipsa, et leges quibus parent, meliùs cognoscantur. His autem inventis, sed non antea, exquirere licebit, num vis, unde proveniunt, galvanicae, aut alius jam notae vis modus tantùm sit, an potius novum prorsus principium.

Multum a physiologis inquisitum est, quomodo partes concretae absorbeantur. Hunter, ut supra notavimus, extrema resorbentia vasa, tanquam erucae, rodere conjectavit. Notavit Bichat, absorptionem cum corpusculis agere, et difficultatem de submovendis partibus concretis,

omnino esse imaginariam. Haec sententia tam verè de multis aliis mutationibus quam de absorptione proferri potest. Penitus itaque absurdum videtur, easdem visibiles particulas in sanguine, in variis corporis texturis, et in multis secretis humoribus, imo etiam in coctis carnibus exquirere.

Vanae itaque aestimandae sunt plures microscopicae investigationes, ab EVERARDO HOME, et BAUER institutae, " quoniam" ut ait LUCRETIUS

" ——— Extremum cujusque cacumen
" Corporis est aliquid nostri, quod cernere sensus
" Jam nequierunt."

Constat experimentis MAYER et MAGENDIE varias materias a matre in foetum per absorptionem transire : de hac autem absorptione nihil dicendum habeo.

Vegetabilia non minus quam animalia absorbendi functione fruuntur, illis autem non aequè ac his, operam dedi ; licebit tamen, sequens experimentum proferre. In figlino, lauto sabulo impleto, gramina varia, fabas, pisa, atque alia semina conserui ; totum deinde haud tenui infuso croci madefactum, in locum obscurum seposui, ne color ullus in plantis ipsis generaretur, et subinde irrigationem cum supradicto infuso repetivi. Germina brevi pullulare sed nequaquam croco tincta. Infusum tamen colorem magnâ ex parte amisit, et odorem peculiarem acquisivit. Infusum autem, in quo semina non aderant, vix, aut ne vix quidem, mutatum est. Parùm dubito quin supra dictae mutationes seminum cotyledonibus, ut vocantur, et putaminibus partim productae sint, multum tamen tribuo decompositioni ab ipsâ germinatione provenienti. Ex hoc experimento conjicio effectus, quos DESFONTAINES et alii obtinuerunt, ex vasorum sectione pependisse.

Nunc tandem, quantum meo proposito convenit, et forsitan ampliùs quam lectoris patientia condonabit, absorbendi functionem exposui. Restat modo pauca proferre de quibùsdam effectibus, qui, ut mihi videtur, ex absorptione modo quo fieri suspicatus sum perfectâ, provenire possunt.

DE QUIBUSDAM PHAENOMINIS CUM ABSORBENDI FUNCTIONE UT SUPRA PROLATA EST CONJUNCTIM CONSIDERATIS.

Quoniam hanc dissertationem jamjam, insolitâ ratione, produxerim, rerum duntaxat fastigia sequi licebit.

Quamvis haud necessarium sit plura dicere, de utilitate duorum vasorum ordinum, ad varias materias a chymo separandas, quippe cùm lector ex superiore parte, meas de hac re opiniones facillimè concipere possit, non omnino supervacaneum erit eorum utilitatem, in variis corporis partibus examinare. Quaeri enim potest. Si hae partes uno tantum vasorum ordine, arteriis scilicet, deponuntur, quamobrem ad illas submovendas duobus opus est? Respondeo: Corporis partes fere in hoc modo elaborari suspicor. Cùm sanguis arteriosus ad extrema vasa pervenit, cum venarum et lymphiferorum vasorum initiis committitur. Haec enim vasa ubique in corpore adsunt.

Nunc si haec vasa diversas materias attrahunt, modo in variis structuris diversâ proportione concurrant, et tertia substantia relicta varietates totidem exhibebit. Novae autem particulae natura, partìm pendet ex naturâ adjacentium particularum, atque multùm, ni fallor, ex compositione particulae cui successura est, et quae cum reliquo sanguine, vasis absorbentibus submovenda est. Errant autem, qui tales corporis ruinas, in istis vasis exquirunt, nam ut supra diximus, omninò decomponuntur. Praetereà licet veteres particulae, a novis quodammodo discrepent, tamen cùm inter se utraeque commutatae sunt, sanguis ad cor rediens, postquam illas amisit, et his acceptis, venosus evasit, eo usque reparatur, ut in omnibus texturis eandem speciem habeat.

Multum a Physiologis disputatum est de secernendi functionis naturâ. Alii existimavere secretos humores ex sanguine minutis vasculis esse colatos. Alii multum motui tribuunt, atque alii fermentationem in auxilium vocant. Nonnulli dicunt secretionem ex peculiari vasorum actione dependere. Hoc autem, rem nequaquam explicat: factum tantummodo alitèr exprimit. Vis galvanica, cui tantum tribuitur a quibusdum claris viris, secretionis causa habe-

tur. Nuperrime chemicus ille celeberrimus THENARD postquam deutoxydum hydrogenii, fibrinâ sine ullâ mutatione hujus materiae, decomponi posse invenerat, humores in corporibus animalium, fibrinâ secernentium organorum decomponi, et ita secernendi functionem explicari posse conjectavit. Ego vero suspicor, hanc functionem in actione constare simillimâ actioni quam corporis partes elaborare supra imaginatus sum.

De secernendi functione quaestio inter physiologos orta est, quam omninò praetermittere nolo. Alii enim, quos inter numerandus est ADELON omnes corporis partes, atque omnes secretos humores ex arterioso sanguine formari docent: Alii autem sanguinem venosum ad bilem saltem formandam conferre existimant. JACOBSON verò, ex quibusdam observationibus in piscibus institutis, sanguinem venosum, multo majore functione fungi conjectat. Cum illo quoque consentit BLAINVILLE, qui plurimos secretos humores, huic sanguini attribuit, et credit etiam vasa pampiniformia, et lien quoque, organa constituta fuisse, quae sanguinis moram efficiant, quâ ad nonnullos secretos humores formandos aptior fiat. Licet hanc notionem non amplectar, effectum peculiarem sanguinis venosi morae esse attribuendum reor, formationem scilicet nigrae materiae quod naturalitèr in oculo, et in Ethiopis cute existit, et pigmentum constat, et quod morbo, saepe in pulmonibus, non rarò in liene, et interdum in aliis partibus, ut in cute hominum etiam a Caucasiâ stirpe generatorum existit.

Ecce argumenta quibus haec opinio nititur.

Primo ea exempla examinemus, quae nobis pathologia profert, horum enim causae plerumque evidentiores sunt.

Materies nigra, quae in pulmonibus et in glandulis bronchialibus reperitur a PEARSON, carbonio cum aere inspirato, perperam tribuitur. In parvâ quantitate nullum incommodum parit, et in adulto adeo vulgaris est, ut multis medicis nequaquam morbida videatur; interdum vero, magnâ quantitate existit, ut in iis qui in arctis urbium vicis habitant, aut in profundis fodinis vitam degunt, at longè prae aliis in iis qui phthisi laborant, aut alio quovis morbo, qui per longum tempus functiones magnae pulmonum partis impedit. At in omnibus his exemplis sanguis per pulmones, non solitâ ratione cursum habet, et imperfectè ab excessu carbonii purgatur. Lien quoque in se multum sanguinis venosi

habet, qui praetereà tardo circuitui obnoxius est, praesertìm si mea de hoc organo conjectura admittitur.*

Si eorum exemplorum, in quibus cutis nigruit, historiam investigabimus, hoc effectum a repentino et opprimente terrore ortum fuisse inveniemus. Sequens exemplum proferre sufficiet. Inter horrores Gallici imperii eversionis, femina capite damnata est, quâ sententiâ eo usque affecta est ut cutis more supra dicto brevi nigruerit: remissâ vero paenâ, illa permultos annos vixit, et nigrum calorem, tempore tamen levitèr minutum conservavit.

Post mortem cutis explorata est, et materies colorata in rete mucoso reperta est, vel, ut diceret BLAINVILLE, super rete vasculare verum pigmentum impositum est.

Nunc ad oculum respiciamus, in quo certè naturalitèr, et in sano statu nigra materies existit. Nonne venae contortae sunt (unde etiam vasa vorticosa vocantur,) eo proposito, ut sanguis moretur, et pigmentum deponat, quo lucis errantes radii absorbeantur, et oculi globus opacus reddatur? Vidi ante paucos dies HEUSINGRI recentem de pigmento nigro dissertationem. Hic auctor quoque existimat materiam nigram ob excessum carbonii formari, et eodem principio tribuit oculi pigmentum, materiem nigram in pulmonibus, et materiem colorantem capillorum, unguium et pennarum. Nonne meae opinioni consentaneum est, ma-

* Vide Edinburgh Medical et Surgical Journal. In hoc libro, lien organum esse proposui, quo graves effectus ex auctâ copiâ fluidorum, et ex diminutâ capacitate vasorum prohibeantur. Tunc temporis nesciebam Doctorem RUSH, Philadelphiensem, eandem sententiam emisisse, et Doctorem BROUSSAIS in praelectionibus suis huic similem notionem proferre. TIEDMANN et GMELIN volunt hoc organum, vasis chyliferis et lymphiferis tanquam appendicem esse, in quâ lymphâ coeundi facultatem, et subrubrum colorem adipiscitur. Hae autem proprietates manifestae sunt in lymphâ quae nec lienis actioni subjecta est, neque lympham ex liene provenientem accepit. Credo equidem lympham has proprietates in omnibus corporis partibus comparare posse, etsi in iis praecipue, quae in se multum sanguinis habent. Non tamen reticendum est illos physiologos ad experimentum confugisse. Lienem canis executerunt: bestia paucis diebus convaluit functiones parum turbatae sunt, modo paulò macrior quam antea videbatur. Post dies octodecem occisa est, et exploratores testantur, partem chyli coactam, solitò minorem fuisse. Hanc autem observationem omnino vitiatam aestimo, eo quod bestia prussiatum potassae devoraverat, qui alio experimento, integro liene, chylum fluidiorem quam solitum fecisse videtur. Macies partim vulneri tribuenda est, partim canis graviditati, quinque enim foetus in tubis reperti sunt, qui miro quodam errore, quartum vel quintum mensem attigisse dicuntur.

teriem colorantem pene deesse in iis, quibus arteriae exuperant.

Nunquam mihi sepiam explorandi occasio contigit, scire tamen exoptarem, num organum, quo atramentum secernitur, cum meâ conjecturâ congruat.

Si sanguis ad fines arteriarum, eo modo disponitur, quem supra conjectavi, mihi videtur hoc ad sanguinis motum nonnihil conferre debere. Sic in canalibus et rivulis objectaculis munitis, his apertis, fluxus inducitur. Similem quoque originem Cl. Franklin quibusdam procellis attribuit.

Imaginari non possum quomodo extremorum vasorum contractiones, circuitum sanguinis promovere possint.

Itaque non modo Cl. Bichat horum vasorum contractiones organicas, sed etiam actionem quam illis tribuit Wilson Phillip, planè rejicio. Dispositionem sanguinis ad fines arteriarum plus efficere, quam ullam istorum vasorum actionem, ex hoc argumentor. Scilicet ubicunque adest seminatum ovum, sive in utero, in tubo, in ovario, vel etiam in peritoneo, illic sanguinis cursus attrahitur.

Parum adhuc causam intelligimus, cur quaedam partes prae aliis interdum insigniter increscant. Factum tamen non incommodè a Blumenbach exprimitur, et nisui formativo attribuitur. Hoc in annua cervorum cornuum renovatione conspicuum est, at hîc quoque auctum sanguinis cursum non primarium esse, sed secundarium, et supra dicto more inductum, existimo. In foetibus corde carentibus, sanguinis motum, ut opinor, multò meliùs huic causae quam aut arteriarum contractionibus, aut alius foetùs cordi, attribuendum est. In vegetabilibus, cum nullum organum ad succum movendum specialitèr constitutum habeant, multùm actioni ei quae supra prolata est simillimae tribuendum est. Actio quam nunc ad sanguinis circuitum auxiliarem protuli, mihi longè verisimilior videtur, quam ea quae ad hanc finem imaginatus est Carson. At ne quis existimet, me arterias non nisi tubos inertes habere. Licet illis non attribuam facultatem ullam, quâ sanguinis circuitus effici possit, lubentissimè concedo, motum sanguinis ab aliis organis excitatum, modificationes ab arteriis accipere. Sic ob vim resiliendi, ad motum inaequalem, ex cordis alternanti actione provenientem, constantem et aequabilem efficiendum tendunt. Ob *tonicitatem* morbo mutatam, sanguinis rivum non semper eâdem ratione amplectitur, et inde partim oriuntur mirae pulsuum diversitates. Vasa

quoque in ipsum sanguinem agunt, et ejus conditionem afficiunt.

Sic HEUSON sanguinem in propriis vasis stagnantem, solitâ ratione non coire demonstravit. Hunc effectum sagacissimus HUNTER nequaquam ignoravit, et recentiùs ingeniosus BLUNDELL, hâc de re non nulla experimenta instituit. Non modo GULIELMI HEUSON, de retardato sanguinis in vasis coitu, assertionem bene confirmavit, sed praeterea, vasa, postquam tunicae suae, aut frigore, aut nicotianâ infusâ, aut alio quovis modo valde laesae sunt, hâc facultate sanguinem liquidum servandi carere demonstravit. Ex quo vitam sanguinis ex mutuâ sed inexplicatâ actione hunc inter et vasa sanguifera pendere, conjectavit. Nonne igitur natura, in mirabili illâ functione, quâ creationis opus quodammodo aeternum fecisse videtur, sanguinem, ex quo faecundi humores formandi sunt, per longas, tenues, et tortuosas arterias spermaticas transmisit, eo proposito ut *hypervitalis*, ut ita dicam, evadat.

Haec enim conformatio in illis animalibus, quae hâc functione prae aliis pollent, ut in tauro et in ariete*, praecipuè observanda est.

Multùm profectò de absorbendi functione, ad morbos spectante disseri potest. Non modo multis in morbis maciem, signum quidem notabile inducit, sed etiam haec functio laesa, non nullorum morborum origo, seu causa proxima habenda est. Omnium pene consensu struma, et quaedam hydropis varietates hûc referuntur.

Nec multum abest quin mihi persuasum sit, febris ipsius essentiam constare, in eâ functione laesâ vel pene suppressâ, quâ variae corporis partes assiduè mutantur. Haec autem quaestio multo copiosior est, quam ut hìc tractetur. Inflammationem quoque, ut opinor, et scorbutum, si functiones cum absorptione conjunctae non nimis fuissent neglectae, multo meliùs intelligeremus. At ne lectoris benevoli patientiâ diutiùs abutar, de his, itemque de Hydrargyri et aliorum quorundam medicaminum in absorbendi functione effectibus, et agendi rationibus, conjecturas meas proponere in aliud tempus differam.

* In excellenti opere CUVIERI, ornatissimi quidem Philosophi, et animalium scientiae excultorum omnium facile principis, haec facultas in ariete multò minoris aestimatur, ut abundè demonstrant facta, de quibus in Sussex comitatu Anglico ovium culturâ notatissimo, certior factus sum.

SINCE writing the preceding Thesis, I have had the advantage of perusing some valuable articles relating to the subject of absorption, which have been written subsequently to, or near the same time, with my Essay. The most important of these, are two papers by Leonardo Frunchini, published at Bologna, in 1823; that of Fiscinus and Seiler of Dresden, republished in the "Journal Complimentaire du Dictionnaire des Sciences Medicales;" that of Michael Fodera on Absorption and Exhalation; several papers by Regulus Lippi, Professor of Anatomy at Florence; and of Fohmann and Louth of Germany, on the Anastomosis of the Lymphatics with the Veins; the researches of Dr. Barry on the Influence of Atmospheric Pressure; and of my friends, Dr. Addison and John Morgan, on the Modus Operandi of Poisons.

I must not swell this volume with an analysis of these publications; but restrict myself to mentioning the principal facts which they severally relate, whether in support or refutation of the statements which I have made.

It has been objected to the view which I have taken of the function of absorption (p. 346.), that it is far too chemical; but I would beg to state in reply, that I apprehend that in this respect I have been somewhat misunderstood.

I am fully prepared to admit, that the science of chemistry, as it at present exists, is unquestionably inadequate to explain many of the phænomena presented by animal life; but I consider, that as in many of these phænomena chemical affinities are counteracted, and numerous new chemical combinations formed, processes essentially chemical are going forward, which we can never fully understand, even to the extent which our limited powers will allow; unless

we investigate them with the assistance of chemistry. In saying this, let me not be regarded as considering life as merely a chemical phænomenon. The functions of living organized beings involve the operation, not only of chemical, but of every other physical agency, and in our investigation of these functions, if we wish really to improve our knowledge of the attributes of life, we must not reject our knowledge of those agents, but rather regard whatever is fixed in them as a known quantity, which may greatly aid us in ascertaining other quantities, as yet unknown. Scarcely any important step is taken in any department of physical knowledge, which does not give us a clearer view of some vital function. The labours of Nysten, Dr. Stephens, and Dutrochet, afford good illustrations of this assertion.

Those who feel interested in this subject, will do well to read the Essay of Dr. Pritchard on the Doctrine of a Vital Principle, which contains many important considerations connected with the study of the phænomena of life.

The permeability of the animal tissues, alluded to in the second note, p. 349, is further considered in the sequel.

Page 350. The experiments of Dr. Edwards, referred to in the first note, have been detailed in the previous part of this volume.

The functions of the eighth pair of nerves, which are glanced at in the second note, will be noticed in conjunction with the consideration of the influence of the nerves on absorption.

Page 354. The elaborate article of Fiscinus and Seiler, who conducted their enquiry at the Veterinary School at Dresden, contains a much more detailed account of the discovery and investigation of the lymphatic system, and of the controversy which ensued, than I had met when

composing the Thesis, or than I have seen in any other work since.

To the names of the early contributors to our knowledge of the anatomy of the lymphatic system, which I have already enumerated, must be added those of Pecquet, Van Horn, Rolfink, Severinus, Hilden, Wurm, and Highmore; and of a somewhat later period, Steno, Nuck, Stalport, Vander Weil, Brunner, Rudly, Ruysch, Mery, Saltzmann, Winslow, and Blaes.—From the second half of the seventeenth century, and during the first part of the eighteenth, Swalve, Walæus, Diemerbrœck, Lower, Pauli, Bohn, Cole, Wharton, Gottsched, Blanch, Glisson, and Charleton, declared themselves in favour of lymphatic absorption. Two periods are particularly interesting in reference to this subject during the second half of the eighteenth century, viz., from 1780 to 1799, when the Hunters, Sograffi, and Heuson, and subsequently, from 1780 to 1799, when Cruickshank, Mascagni, Sheldon, Sœmmering, Blumenbach, Ludwig, Haase, Werner, Feller, Desgenettes, Oudmann, and Schreger, contributed, both by experiments and arguments, to overturn the old doctrine of venous absorption, which from the year 1798, was scarcely supported by any one.

Those who are disposed to investigate the controversy, which was rather renewed than commenced by the Hunters and their opponents, may consult Haller, Cruickshank, Sheldon, Rezia, Mascagni, Lindner, Lupi, Sœmmering, Ludwig, Oudmann, and Lorinser.

Page 355. Although I have expressed a doubt as to the propriety of admitting the capillary system, as proposed by Bichat, from the idea that mere minuteness is not a sufficient ground of distinction to lead us to separate, either the small arteries, or veins, or lymphatics, from the set of vessels to which they belong, the recent highly interesting observations of my friend, Dr. Marshall Hall, appear to afford

demonstrative evidence of a system of minute vessels, intermediate to the extreme arteries and veins, and anatomically distinct from both. "It is quite necessary," says Dr. Hall, "to distinguish the capillary vessels from the minute arteries from which they arise, and the minute veins to which they belong. The minute vessels may be considered as arterial, as long as they continue to divide and subdivide into smaller and smaller branches. The minute veins, are those vessels which gradually enlarge from the succession of smaller roots. The true capillary vessels are obviously distinct from each of these; *they do not become smaller by subdivision, nor larger by conjunction,* but they are characterized by continual and successive union and division, or anastomosis, whilst they retain a nearly uniform diameter."

The anastomoses of minute arteries, though mentioned by many authors, the Doctor states to be of so rare occurrence, that after diligent search he has not been able to meet with a single instance of them. Anastomes between the roots of veins, he regards as not uncommon. These differences between the true capillary vessels, and the arteries and veins, have a manifest influence on the mode in which the blood circulates through them. Its course becomes of only half its former velocity, and consequently the particles, instead of moving too rapidly to be seen, become distinctly visible.

Dr. Hall suspects, that the true capillaries are mere canals, instead of being real tubes, by which, I suppose him to mean, that they are not possessed of distinct coats, independent of the structure through which they pass. It is obvious, that this difference must materially contribute to modify their functions. (See Dr. M. Hall on the Circulation of the Blood, a work abounding in important facts and views.)

The existence of the capillary vessels above described, and

the want of any sufficient proof, that either arteries or veins in a state of integrity, are furnished, with open mouths, go far to do away with the idea, that there is a peculiar structure void of vessels intermediate to the termination of the arteries and the origin of the veins. But the admission of the continuity of the arteries and veins, through the medium of the capillaries, seems to imply the existence of a non-vascular structure, through which they circulate. The microscopic examination of the animal tissues favours the same conclusion.

Page 358. The fullest investigation of the communications by which the lacteals and lymphatics, discharge themselves into the venous system, is that which we owe to Fohmann, Louth, and Lippi. The last author has justly received, as the reward of his indefatigable labours, one of the prizes awarded by the Royal Academy of Sciences of Paris, and I cannot do better than refer the reader to his work, intitled *Illustrazioni Fisiologiche e Patolgiche del Systema Linfatico-Chilifero mediante la scoperta di ungran numero di communicazioni de esso col venoso*. It must be regarded as a valuable and important contribution to anatomical knowledge, whatever be the opinion entertained of the author's physiological views.

Some of these communications had also been described by others, viz., those of the lymphatics of the broad ligaments with the hypogastric veins by Wepfer; Steno had pointed out those of other lymphatics, with the cava and the axillary and jugular veins. Nuck traced those of the arm to the lumbar veins; Lobstein those of the spleen to the vena portæ; and Mertrud others to the subclavian. Seiler often saw mercury pass into the veins from the lymphatics. It frequently happened with the lymphatics of the thigh, and was almost always the case when the mesenteric glands were injected. The last mentioned fact completely accords with the observations of Meckel, whose opinion has been adopted by Falconer, Lindner, Ludwig,

Caldani, Wrisberg, Lenhossek, F. P. Meckel, and Ribes.

Page 359. *Communications between the internal surfaces of various cavities and canals, and the lymphatic vessels.*—Seiler has often seen the lymphatics injected from the duct of the pancreas, the vas deferens, and the canal of Steno. Walter has observed the same thing in the lactiferous tubes. Lippi filled the neighbouring lymphatics of the liver from the cavity of the gall bladder. It frequently happens, that the lymphatics of the liver and spleen are filled when those organs are finely injected.

Page 359. *Communication between the arteries and absorbents, or lymphatics.*—Lippi says, that the lymphatics arise from the arterial system, as well as from the surface of membranes, and wherever secretion or effusion takes place.

Page 360. *Communication between the minute extremities of lymphatics and veins.*—Lippi describes the lymphatics of the kidney inosculating with those of the emulgent veins by a kind of capillary vessel.

The following authors may be mentioned, in addition to those whose names are cited in the Thesis, as supporters of the doctrine of absorption by the lymphatics:—Glisson, Wharton, Derelincurtius, Needham, Lenoble, Collins, Van der Sande, Sografi, Fœlix, Ludwig, Feller, Haase, Oudman, Schreger, Fohmann, Lippi and Louth.

The work of Oudiman, is regarded by Fiscinus and Seiler as an able performance in support of lymphatic absorption, but they consider him not sufficiently rigid in the examination of the experiments of his party, nor does he attach sufficient importance to the arguments of his opponents.

The experiments of Schreger, which are some of the latest that have been brought forward to establish the exclusive right of the lymphatic system to the character of absorbents, claim particular consideration from the author

being an acknowledged good observer, as well as from his having been previously a strenuous advocate of venous absorption. Yet, the opinions of both these experimentors, but more especially of the former, appear to be nearly as much founded on the inability to detect milk, and other substances, in the veins, as on direct proofs of their absorption by the lymphatics. The following experiments of Schreger's seem to require some confirmation or explanation. A bandage was tied round the hind leg of a puppy, as near as possible to the pelvis. The limb was kept twenty-four minutes in tepid milk — the lymphatics were then filled with milk — the veins contained none. The bladder of a dog was filled with milk; the crural arteries were tied — in twenty-four minutes the vesical veins were almost empty, and the little blood which they contained, was unmixed with milk; but there was some in a few of the lymphatics. In bleeding a woman from the foot, it happened, that a lymphatic vessel was divided; there continually flowed from it a quantity of lymph; the lower part of the foot was immersed in tepid water mixed with a solution of musk. The lymph was collected in a cupping-glass, and blood was taken from a vein opened on the upper part of the foot; the former soom smelt of musk, the latter not in the least. In at least one of the experiments performed by Fiscinus and Seiler, it happened, that when madder had been given, the chyle was remarkably red. In five of their experiments, in which an alkaline solution of lead was either given internally, or applied externally, lead was detected in the chyle. Traces of arsenic, and also of nitrate of silver, have also been found in the contents of the thoracic duct. In two other experiments, in which turmeric had been employed, the chyle presented a yellow colour, which was heightened by the addition of an alkali.

Lippi, the friend and disciple of Mascagni, is the last

and most strenuous advocate for the doctrine of absorption, performed by the lacteals and lymphatics, exclusively. I have already alluded to the anatomical facts on which his views are founded. These views manifestly present lymphatic absorption, under a modified character, in which it seems to evade some of the objections urged against it by the supporters of venous absorption; but they appear to be liable to others, some of which, I have anticipated at p. 367.

Page 365. Besides the recent experimenters whom I have mentioned, and to whose labours I shall presently revert, the following names may be added to the list of those whom I have cited, as supporters of the ancient doctrine of venous absorption, — Bills, Jacques de Back, Schneider, d'Azout, Horn, Mortimer, Brendel, Darwin, Walter, Lenhossek, Malfatti, Caldani, Lupi, Hartman, Prochaska, Treveranus, Reil and Jæckel.

The experiment referred to at p. 366, was performed by Segalas and read by him in the Royal Academy of Science of Paris. I cannot omit this occasion for protesting against inferences drawn from experiments, in which the functions of the animal, or part of the animal, are so completely interfered with, as they must have been in this instance, in which the lymphatic vessels alone remained to connect the intestine with the animal. This objection applies almost to the same extent to the celebrated experiment of Magendie, in which the poisoned limb was connected with the body of the animal, solely by the means of the circulation maintained through the pieces of quill, which united the divided vessels. Though this experiment may succeed in the hands of the able physiologist who devised it, yet it must be regarded as one of the greatest difficulty, since, besides the objection already urged, there is another of equal practical importance in the coagulation of the blood in the quills. This

obstacle proved insurmountable, in various attempts made by my friend J. Morgan, and equally defeated another distinguished physiologist, who attempted to repeat the experiment. It may be objected against some of the experiments performed by Magendie, that the production of the peculiar effects of a poisonous agent, is no sufficient proof of that substance having been absorbed. This is fully admitted by Franchini, especially in those cases in which the quantity of poison employed is very small, and the operation of the poison is violent and rapid. The strongest confirmation of this objection, is furnished by the researches of my friends, Dr. Addison and J. Morgan, respecting the operation of poisons on the living body. They have clearly proved, that the effects of poisons do not depend on the contamination of the fluids circulating through the system. A connection having been established between two dogs, by means of the large vessels of their necks, the blood from the one, expiring under the influence of a poison, with which it had been inoculated, was transmitted with impunity into the second. To render this trial as complete as possible, a mutual interchange of blood was established, the trunk of the carotid of one dog supplying the branches of the other, and the jugular vein of one discharging itself into the heart of the other. The animal, which had not been wounded with the poison, exhibited not the least indication of its influence. Although the widely received doctrine, which ascribes the influence of poison to absorption, and more especially to venous absorption, is thus invalidated, the question of absorption is left untouched. Without reference to the effects produced on the system, it is very evident, that many substances are introduced, with little change into the body, though the channels by which they do so may elude our search. Leonardo Franchini, a disciple of the old doctrine, undertook his experiments with a view

to elucidate this subject. He repeated with great care, the various experiments of Lister, Musgrave, Hunter, Haller, and others, who have described the absorption of coloured, odoriferous, and other substances, by the lacteals and lymphatics, but his results drawn from fifty experiments, most essentially differed from theirs. On the other hand, he found many of those substances in the blood of the vena portæ, and other veins. He sums up the results of his experiments, in the following conclusions: — 1. "The white, or lymphatic vessels of the intestines, are the true absorbents of the chyle. 2. It is not proved, that they absorb any other fluids from the interior of the intestines. 3. There are no valid arguments by which it is proved, that the lymphatic vessels of other parts are absorbents. 4. The veins certainly absorb from the interior of the intestines, from the cavity of the abdomen, and from the bronchi. 5. It is not proved by experiment, whether the lymphatics of the veins absorb from the minute cavities of the cellular membrane, and from the interstices of the different tissues. 6. Many facts, both physiological and pathological, render it very probable that the absorption of fluids from these cavities, is, at least, to a great degree, performed by the sanguiferous vessels." Perhaps, the most important and original part of Leonardo Franchini's paper, consists in the satisfactory explanations which he has offered of some of the contradictory statements, which the supporters of the conflicting opinions have advanced. He had frequently repeated the experiments of Lister, Musgrave, Hunter, Haller, and others, in which indigo, and other blue pigments, had been employed, without perceiving any blue colour in the lacteals, or lymphatics; when on one occasion, having kept the animal fasting longer than usual, he observed that these vessels presented a light blue tinge. At first he conceived that the protracted fasting had favoured the absorption of

the colouring matter; but having afterwards observed the same appearances, produced after continued abstinence, whether the blue colouring matter had been given or not, and even when a red pigment had been employed, he was led to discover that the blue tinge of the vessels, was nothing else than their natural appearance when filled with a limpid fluid. He placed some of the fluid from these vessels on white paper, and found that it did not present the slightest trace of any blue pigment: he examined it with a microscope, with the same result. Having made this discovery, with regard to the apparent absorption of blue pigments, he looked for similar explanations of those cases, in which other colours appeared to have entered the lymphatic system. Although in his own experiments, he had never seen anything to make him believe, that undigested milk is ever taken up by the lacteals, or lymphatics, he found that a mistake might easily be made, by not disdinguishing milk from the true chyle, and he believes, that in those cases, in which milk is reported to have been found in these vessels, chyle, the product of a previous meal, or of the digestion of the milk itself, had been mistaken for it.

Though, I believe, this last explanation of Franchini, may, in some cases, be correct, there are others to which it does not apply, as I have already observed, in noticing the same objection as urged by Professor Magendie, see p. 327. In respect to the absorption of red coloring matters, Franchini made observations, similar to those above noticed, respecting blue pigments; at first it appeared that some absorption of madder really took place when the animal had been long fasting; but he discovered that the same red, or pink tinge, might be produced when the animal had taken no colouring matter, or even matter of a different hue. The red colour could not, like the light blue, be ascribed to an optical deception; but an explanation of

its occurrence was found in the fact, that after long fasting, the fluid in the lymphatics and lacteals, really possesses a reddish colour, which is sometimes proper to itself, and at other times appears to be owing to an accidental admixture of blood.

Fiscinus and Seiler, may be numbered amongst those experimenters, who have most unequivocally proved the absorbing power of the veins, but they do not go so far as Magendie and Franchini, in restricting the office of the lacteals to the absorption of chyle only. They do not consider it as proved, that the lymphatics in other parts of the body are endowed with the power of absorption. Although their numerous and varied experiments appear to have been conducted with great care, they candidly admit, that they do not consider the subject of absorption as by any means settled.

The results of their experiments may be briefly stated as follows: — 1. They found indigo in the venous blood, but not in the chyle or lymph. On two occasions, a slight trace of turmeric was detected in the chyle, but they in vain sought for lac, madder, and indigo, in this fluid. They confirm the frequent appearance of a red tinge in the chyle and lymph, when no red colouring matter had been given.

2. The odour of Dippel's empyreumatic animal oil was frequently met with in the venous blood, never in the chyle or lymph. They do not appear to have found camphor in either.

3. They generally found prussiat of potass in the venous blood and urine, but only in one or two occasions, a trace of it in the lymphatic system. In five experiments they found traces of lead in the chyle, when an alkaline solution of that metal had been employed. They appear likewise to have found this metal in the venous blood. Nitrate of silver and arseniate of potass, produced indications of silver

and arsenic, both in the blood and chyle. They support the observations of Wollaston and Marcet, respecting the occasional presence of foreign matters in the urine, when they cannot be detected in any of the other animal fluids. They object to the lymphatics being possessed of a secerning power so delicate, that having absorbed all substances indiscriminately, they transmit some entirely to the veins, whilst they retain others and convey them to the thoracic duct. They think it far more accordant with the laws of affinity, which regulate organized bodies, that vessels containing venous blood should take up certain substances, which are insusceptible of being absorbed by the lymphatics, whose structure is different.

Page 367. The celebrated Rasori, whom I had the pleasure of visiting at Milan in 1824, informed me that he had published, in the Annals of Science and Literature for 1810, some facts relating to absorption and the passage of substances into the urine, but I have not had the advantage of a reference to that paper.

Page 368. *What are the properties which render some substances liable to absorption by the lacteals, and what are those which render others liable to absorption by the veins?* Since the original publication of the Thesis, I have had but little opportunity of inquiring into the accuracy of the principle which I there proposed; but so far as I have been able to do so, either by observation, or by appeal to the results obtained by more recent experimenters, I am led to comfirm rather than recede from the opinion which I there advanced. The following experiment was performed with a view of observing the effect, produced by giving a decidedly alkaline character to the contents of the stomach and intestines, without rendering them of a more irritating quality than could be avoided; and also, of trying a peculiar pigment, which is both an animal substance, and

of a colour not liable to be confounded with any of the hues which the lacteals, or lymphatics, or their contents, may present.

The subject of this experiment was a full grown, half-bred, bull bitch, which had pupped about three weeks before. After fasting for about twenty-four hours, she received some calcined magnesia in new milk — this was taken with avidity —The object was to remove all acid from the intestinal canal. This dose was repeated. Sub-carbonate of soda coarsely powdered was next given her at short intervals, inclosed in small pieces of fresh boiled horse-flesh, and some of the same salt was also given to her dissolved in milk. She took both almost without hesitation, though the salt was very imperfectly concealed. Some of the green pigment taken from the placenta of a bitch, was also given with some of the same kind of meat. This pigment was previously examined with test paper and proved to be neutral; it was, however, rather putrid, having been taken from the uterus of a bitch killed more than a week before. This pigment had been found not to change colour by the addition of either alkali or acid. The fragments of meat in which this pigment was given were taken with great hesitation, unless considerable pains were taken in concealing it, or the piece caught in the air and bolted. The administration of these different articles lasted about three-quarters of an hour, and was completed about one P. M.; about ʒij of magn. calc. had been given, and nearly three-quarters of an ounce of soda sub-carb. She afterwards lay quietly. She was killed at about half past one o'clock by a blow on the head. The abdomen was quickly opened. The contents of the stomach and small intestines were decidedly alkaline, as shewn by restoring the blue colour of reddened litmus paper. In dying, the animal passed

a copious watery digestion, which appeared also alkaline. The chyme was coloured by the green matter which had been given, and which was not altered by the juices of the stomach. The lacteals, more particularly those from the upper part of the intestinal tube were filled with perfectly white chyle, which possessed decidedly alkaline properties. The thoracic duct was also turgid with the same fluid, about two or three drachms of this were collected perfectly pure. It was quite white, and had the appearance, as to consistence, of very rich milk. In little more than half an hour it coagulated into a thick grumous mass, and acquired a just perceptible shade of pink or lilac. The blood from the mesenteric veins was collected in large quantity; it coagulated in a short time—no streaks of chyle could be observed in it, but an appearance resembling this, was in one instance manifestly produced by the division of a small lacteal vessel, which passed over the vein at the part where it was opened. This blood was alkaline, both when examined as it flowed from the vessel, and when coagulated, and separation had taken place; but it was less so than the chyle—the serum was remarkably limpid and colourless. A little acetic acid diluted with water was thrown into an emptied portion of intestine, included between two ligatures, but vitality was too far gone for this to be considered part of the experiment.

The result of this experiment, which I do not offer as conclusive, is, at least, favourable to the idea that the lacteals are disposed to receive alkaline fluids. The complete rejection of the colouring matter accords with the almost uniform result obtained by all recent experimenters. This part of the subject may be pretty much regarded as settled, since the chyle, of the mammalia at least, examined

after a meal of their ordinary food, is universally described as white, or very nearly so, or slightly tinged with red; whilst the food or chyme, from which it was produced, may have presented every variety of colour. Two slight exceptions are indeed related by Fiscinus and Seiler, in which a trace of yellow was perceived after the administration of turmeric, and in another instance, a similar effect was produced by rhubarb. A similar exception is already stated, with respect to rhubarb, in the Thesis; and another in the case of the colouring matter of bile; it would seem, therefore, that some yellow colouring principles are decidedly susceptible of lymphatic absorption. The cause of their forming an exception to the general rule, seems to merit farther inquiry.

Page 371. I have stated, that some neutral salts are taken up, both by lymphatics and veins. I find this observation confirmed by additional authorities. Those which have metallic bases, appear particularly of this number — lead, iron, silver and arsenic, having all been detected, both in the chyle and blood. Prusiate of potass appears almost constantly to enter the veins; yet, by several experimenters, it has been occasionally detected in the chyle, or lymph; but it would appear, that a considerable interval of time must elapse for this to take place. Hence, it may be questioned, whether the salt may not have found its way into the lymphatic system, through some communicating vein, or artery, and not in the ordinary course of absorption.

The absorption of fixed oils, by the lacteals, seems to be fully confirmed by Tiedmann and Gmelin, in their elaborate work on digestion, although their rivals, Leuret and Lassaigne do not appear to have arrived at the same conclusion.

The absorption of acid substances, by the veins, has

been proved by various authorities, which have come to my knowledge since the publication of the Thesis.

Dr. Stephens has satisfactorily shown, that it is the common effect of all acids to blacken the blood by admixture with it out of the body, and the observations, both of himself and others, show that the same effect is produced when they are administered to the living animal. The alteration that takes place in the transition from arterial to venous blood, which I could only offer as a probable confirmation of this view, is now demonstrated to be owing to the accession of carbonic acid. Acetic acid has been shewn, by Franchini, to be taken up by the veins, not indeed in a free state, but forming an acetate with the alkali of the blood.

I do not pretend to lay much stress on the following observation, as it was made some time after death; but it tends to show that sulphurated hydrogen, which in some respects is allied to the class of acids, has a stronger tendency to be taken up by the veins, than by the lacteals. A patient in Guy's Hospital, had for a considerable time been labouring under constipation, occasioned by a stricture near the termination of the colon. For three weeks before his death, nothing passed from his bowels. On inspection, the intestines, small and large, were found prodigiously distended with fluid fœcal matter, and abundance of gas; the latter, which was allowed to escape from a small aperture, was proved to be sulphurated hydrogen, not only by its insufferable odour, but by the characteristic blue flame with which it caused a lighted taper to burn. A small quantity of blood taken from the mesenteric veins of this subject, was placed unmixed with any substance upon a piece of clean paper and conveyed to a distance, to be smelt by different persons who had not been present at the inspection, and who immediately recognized the smell of

sulphurated hydrogen. A similar trial was made with lymph from the thoracic duct, but no smell was perceived in it.

Page 374. *Respecting the question as to the causes by which absorbed materials enter the vessels.* — I do not know that I can allude more suitably than in this place to the views of Dr. Barry, respecting the circulation through the veins, although their application to the subject of absorption forms only a part of their interest. It was far from being a new idea, that the blood returned towards the heart, in consequence of some other force besides the vis a tergo derived from the impulse given by the left ventricle of the heart; yet, I believe, no one before Dr. Barry, had had the merit of proving, although Huxham had suspected*, that the venous blood was, as it were, pumped towards the chest. Dr. Barry has shewn that the pressure of the atmosphere, is the agent by which this is effected. It is well known, that when an animal extends the capacity of its thorax, by the elevation of its ribs, and the descent of its diaphragm, the atmospheric air penetrates through the larynx and trachea, and fills the pulmonary cells. But it is not only the cavities which are destined to receive air which are filled — the pulmonary veins, and the branches of the cavæ within the chest, are similarly, though not equally dilated. The resistance of the flow of venous blood towards the heart being removed, this blood is sent forward by the pressure of the atmosphere, which becomes a powerful assistant to the remaining influence of the heart.

The following experiment of Dr. Barry, seems to place this beyond a doubt. A spiral glass tube was fixed, with the intervention of a gum catheter, by one extremity to the jugular vein of a horse, whilst the other was immersed in

* See Marshall Hall on the circulation.

a coloured fluid. At each inspiration of the animal, the coloured liquid was observed to rise in the tube whilst it was stationary, or even descended during expiration. This experiment, as well as several others, essentially the same in principle, though variously modified, was frequently repeated by Dr. Barry, in the presence of the members of the commission appointed by the Institute, and many other distinguished physiologists, several of whom have given their public testimony to the uniform and unequivocal results of these experiments. When the hand of the operator was introduced into the abdomen of a living horse, and applied to the vena cava, that vessel was found to be sensibly distended during expiration, and partially to empty itself during inspiration. The Doctor was not satisfied with proving, that fluids were pressed along towards the heart, in veins, and in tubes connected with them, whenever the chest was dilated by inspiration; he showed, that the same effect was produced in tubes communicating with the cavities of the pleuræ and the pericardium. In making the application of this view of the pressure of the atmosphere, as an agent in carrying on the circulation of the blood, Dr. Barry is by no means disposed to limit it to the venous trunks and larger branches. He believes that through their intervention it is felt in the most minute branches, where he believes it becomes important, as the means by which absorption is effected. He represents this fact as practically known to the ancients, who, as Celsus informs us, were in the habit of employing cupping glasses to obviate the effects of poisoned wounds. The Doctor performed may experiments, with a variety of active poisons, on several species of animals, and found that the removal of the pressure of the atmosphere, by means of cupping-glasses, was a certain means of suspending the operation of the poison; whence he concludes: first, that neither sound nor wounded parts

of the surface of a living animal can absorb when placed under a vacuum; secondly, that the application of the vacuum by means of a piston cupping-glass, placed over the points of contact of the absorbing surface, and the poison which is in the act of being absorbed, arrests or mitigates the symptoms caused by the poison; thirdly, that as the veins communicate more freely and directly with the chest than the lymphatic system, they must be the more active absorbents. He thinks that the absorbing powers of the different tissues are in proportion; first, to the pressure to which their veins are exposed; secondly, to the freedom of communication with the thoracic cavities; thirdly, to the permeability of the mouths and coats of the veins; and, lastly, to the number of the veins. Although I have no hesitation in admitting, that Dr. Barry has performed an important service to physiology, in demonstrating the part which atmospheric pressure performs in assisting in the circulation of the blood; yet, I must confess a doubt, as to its having any material influence in promoting absorption, except indirectly through the medium of the circulation. His experiments, connected with this part of the subject, are neither questionable nor unimportant, but they admit of an explanation different from that which he has given. The pressure of the edge of a cupping-glass, under which a partial vacuum has been produced, is not only an effectual interruption to the circulation in the part, but, likewise, cuts it off from nervous influence. That it is the production of this pressure, rather than the removal of that of the atmosphere, is almost demonstrated by the experiments of the late Thomas Ellerby, by which he shewed, that a cupping-glass, firmly pressed upon a part without removing the atmospheric pressure, afforded the same impediment as the exhausted glasses used by Dr. Barry. Even a simple

ring, or open cylinder, produced the same effect. Experiments, nearly similar to those of T. R. Ellerby, have since been performed in Philadelphia, by Dr. Pennock, but with this exception, that he employed the pressure of a solid body over the spot to which the poison was applied. He found that the action of the poison was suspended, so long as the pressure was continued.

Imbibition, or the soaking of fluids through the inert pores of the coats of vessels, and other tissues, has been considered by Magendie, as constituting the essence of absorption. I have briefly noticed in my Thesis, an objection to which this idea appeared liable. The subject has since been carefully investigated by Fodera; and many physiologists, amongst whom may be mentioned Panizza, are supporters of this doctrine.

It seems, therefore, necessary to offer a brief account of it, as well as of the observations upon which it is founded. In this view of the subject, absorption and exhalation are regarded as imbibition and transudation. That is to say, merely the effect of capillarity. It is shewn by an experiment of Magendie's, repeated and confirmed by Fodera, that if a portion of vein, or artery, be detached from the neighbouring parts, and stripped of its cellular membrane, but suffered to carry on the circulation, and some active poison be applied to the surface, the specific effect of the poison will be produced, although the utmost care may have been exercised to prevent the application of the poison to any other part. The fact of the imbibition of the poison, is not inferred from its effect alone, but from its actual presence in the interior of the vessel. The converse of this experiment was tried by including the denuded portion of artery between two ligatures, and filling it with the poison which produced its effect in this instance also. A portion of the intestine of a living rabbit was included between liga-

tures; the mesentery was likewise tied, that there might be no vascular communication between the animal and the portion of the intestine so included. A spirituous solution of extract of nux vomica was then introduced into the portion of intestine, which was then returned to the abdomen. Poisoning took place as before. This experiment was repeated in a more conclusive manner, by introducing a convolution of the intestine of one animal, containing poison, into the abdomen of another animal. This second animal died from the poison, although there could be neither nervous nor vascular communication with the cavity in which it was lodged. He substituted sulphuretted hydrogen for the solution of nux vomica, and found its effects produced on the animal — proving, that gases, as well as liquids, are capable of penetrating through the animal tissues. These results were confirmed by numerous experiments upon recently killed animals, until Fodera, and his friends, were fully convinced, that this kind of imbibition really took place. He placed different fluids in different cavities of the body; as for example, a solution of prussiate of potass in the thorax, and a solution of sulphate of iron in the abdomen: it was not long before a blue colour was observed in the chest and abdomen, and in different parts of the body, showing, that not only had both fluids transuded, but what appeared more remarkable, that transudation and imbibition were taking place simultaneously, and through the same membranes. This curious fact was put to the test in several experiments, by which it appeared to be indisputably confirmed: at least I see no reason to call it in question in the cases which Fodera has related. There is, however, one objection to the application of this principle, which, though not overlooked by Fodera himself, seems to be possessed of more importance than he has ascribed to it. This objection is the same that was long since urged against experiments

of the same nature, as we may learn from the quotation from Celsus already cited :— "Non quicquam esse stultius quam quale quidque vivo homine est, tale existimare esse moriente, imo jam mortuo."

The experiments of Fodera being, in most instances, tried upon dead, or dying animals, or when living animals were employed, with substances so completely foreign to the animal economy, that we may fairly suspect the vitality of the parts to have been somewhat impaired; may very reasonably be supposed to have allowed the inorganic function of transudation and imbibition to have been in operation, to an extent which the unimpaired powers of life could not have tolerated. The following considerations lead me to believe, that this suspicion is correct—if there were a constant and reciprocal transudation and imbibition going forward throughout the tissues of the living body, the result would necessarily be the presence of every principle in every part of the body, and a far greater uniformity in the chemical composition of all the fluids and solids, than actually exists.

It is well known that those animals which secrete the most deadly poisons, are by no means exempt from the fatal effects which follow the introduction of the poison into a wound. For example, the sting of the scorpion is as fatal to his own, as to any other species; yet, each individual carries his reservoir of poison about with him with perfect impunity, although it is only cut off from the rest of his system by a membranous sac. The existence of many partial dropsies, may be urged as another illustration of the limitation which life sets to transudation and imbibition. It is well known that during life, the large intestines are often distended with sulphuretted hydrogen, without the neighbouring parts appearing to suffer from its proximity; yet, after death, a short time is sufficient for these tissues to acquire, to a considerable depth, the peculiar leaden hue

which it imparts. The yellow tinge, which the parts in the neighbourhood of the gall bladder commonly receive after death, has long been pointed out as a striking example of the difference between dead and living matter, with respect to imbibition. The investigation of this subject, requires the application of the principle to which I have more than once referred. The tendency to transudation and imbibition, doubtless exists in the living, as well as in the dead structures; but in the former, it is controuled by a mysterious power which we can only judge of by its effects, and which we cannot better investigate, than by examining the mode in which it resists other powers with which we are better acquainted. The experiments of electricians have so fully confirmed the fact, that electricity, or galvanism, has a powerful influence on the internal movement of fluids, and their transmission through almost impervious substances, that it is by no means surprising that this agent has been referred to; yet, it is very important that we should remember, that we may have only similarity, and not identity of action, and consequently, only employ the facts as assisting our analogical reasoning. The investigations of Dutrochet, a brief account of which is given in a subsequent part of this Appendix, appear to point to a principle, which, whether electricity be concerned or not, is in all probability most intimately connected with many vital phænomena, but more especially with absorption, nutrition, and secretion. These researches not only prove the strong tendency which some fluids have to pass through porous bodies — they also confirm the observations of Fodera, concerning the simultaneous existence of opposite movements, and what appears to be of no small importance, they show how much these movements of imbibition, and transudation, are influenced by the nature of the porous body, and by that of the fluids in contact with it. Instead, therefore, of re-

garding imbibition, and transudation, as phænomena that do not take place in organized beings until life is extinct, we may regard them, when variously modified, as concerned in most of the essential functions of life.

The difficulty of admitting a power of selection possessed by different sets of vessels is very much done away with, and our ideas respecting the molicular changes attendant on nutrition, secretion, and absorption simplified; when, instead of referring them to supposed and imaginary mouths, or extremities of vessels, we may regard them as taking place through the sides of the most minute vessels throughout their course. The difficulty respecting the removal of solid parts, is in particular very much removed. I have repeated in my Thesis, with reference to this point, the remark of Bichat; that entire decomposition takes place prior to absorption, in consequence of which, they may pass into the circulation in a fluid form. May we not conceive the solid parts of the body, such for example, as the most minute fibrillæ of muscles, nerves, cellular membrane, &c., which the most powerful microscopes can place within the limits of our vision, and the more amorphous elements of some of what are called parenchymatous structures, constantly, as it were, washed by the fluids just transuding from, or about to enter the minute vessels which pervade them, and giving up to them those elements which are to be thrown off from the system, and receiving others which are to be deposited in their place. The continual succession of new parts will therefore depend, as I have already suggested, not only on the joint operation of depositing and absorbing vessels, but also on the nature of those particles which they are destined to reinforce or succeed. See p.377. I am aware here that I have been tempted into a mere speculation, and I ask the reader's excuse for intruding it on his attention. Whatever be the precise mode in which

the vessels influence the fluids they contain, or by which they are surrounded, and whatever be the changes taking place in those minute structures, to the support of which these vessels and their fluids are subservient, it is manifest that they are liable to various influences and changes, very distinct from anything which takes place in materials not possessed of life. Physiologists, almost by common consent, point to the nervous system as the medium through which this mysterious influence is conveyed. Notwithstanding the very important advances which have been made in the physiology of the nervous system, it is still the department in which most remains to be done. Justice seems to require, that I should not omit this opportunity of mentioning the laborious, but neglected and almost unknown work of Bellingeri, who appears in part, at least, to have anticipated our ingenious and meritorious countryman, Sir C. Bell, in the distinction which he has made between the respective functions of particular nerves. He plainly distinguished that portion of the fifth pair which does not belong to the semilunar ganglion from that which does so, and pointed out the former as a nerve of motion, as Palletta had previously done. He also described the seventh pair as supplying motive influence to the same parts which receive the ramifications of those branches of the fifth, which proceed from the semilunar ganglion; but as he makes the seventh pair subservient to the functions of animal life, he did not separate the motive from the sentient nerves.

See the Inaugural Dissertation of C. F. J. Bellingeri, published at Turin in 1818.

For the knowledge and use of this extraordinary thesis, I am indebted to my friend S. D. Broughton.

With reference to this interesting subject, I cannot forbear to mention another circumstance, to which I can offer my personal testimony, and which, I trust, will contribute

to allay the jealousy that has been excited in the minds of some.—I passed the winter of 1821-22, in Paris, and was frequently present at the meetings of the Institute. On one of these occasions, I had the pleasure of hearing some of the experiments and inductions of our distinguished countryman, related by Professor Magendie, who passed a just encomium on their author, and admitted the importance of the views which they opened. It can hardly excite surprise, that when this act of justice had been performed, the distinguished physiologist of Paris should himself enter the promising field that was laid open to him, and that his skilful hands should have collected some of the fruits, without abstracting, as has been too gratuitously suspected, from the labours of his predecessor.

Although most important steps have been taken in the physiology of the nervous system, not only in the establishment of the distinction between the nerves of sensation, and the nerves of motion, but also in the improvement of our knowledge of the anatomy of the brain, and the approach to the determination of the functions of several of its parts, which we owe to Dr. Foville, Flourens, Desmoulins, Magendie, Mayo, and others; yet, there are several points respecting which, we still continue in almost perfect ignorance. This is particularly the case with the part which the nerves are supposed to perform in secretion, and other vital phænomena of a chemical character. This influence, whether real or merely imaginary, we may designate, for the sake of convenience, by the term, chemical influence of the nerves. Many distinguished philosophers and physiologists have adopted the idea, that this influence is identical with galvanism. Dr. Young says, "We may imagine that at the subdivision of a minute artery, a nervous filament pierces it on one side, and affords a pole positively electrical, and another opposite filament, a negative pole."

Rolando, who was disposed to dispute the palm of merit with Sir Charles Bell and Magendie, as a successful investigator of the nervous system, attached considerable importance to his having represented the cerebellum as a sort of electromoter, and formed a theory for the explanation of the nervous influences, upon the basis of electricity. Dr. Wilson Philip has particularly distinguished himself, as a staunch advocate for the electric character of the nervous agency. Nevertheless, if we except the experiments which have been adduced by the last mentioned author, we shall find that we have little more than a shrewd suspicion, sanctioned by high authority, for the adoption of the theory. The observations of Dr. Philip, as well as those of Prevost and Dumas, who have trodden in nearly the same path, have been called in question, or attempted to be variously explained away. Hence, it may not be amiss briefly to examine what is actually known, and distinct from conjecture, in connexion with the subject. It is by no means easy, effectually to separate even a part of the body so completely from the influence of the nervous system, as to render the experiment conclusive in this respect, without at the same time so completely interfering with the circulation, as entirely to vitiate the experiment by its complexity. A considerable portion of the body and limbs may be completely paralyzed, as to sensation and motion, and considerable wasting may take place, in consequence of the want of activity of the muscles, and an inferior supply of blood. The process of nutrition is nevertheless carried on, and a certain degree of irritability remains, as shown by the paralyzed part being still susceptible of the influence of various agents—blisters will rise, and eruptions and ulcers may form, and also heal. Moreover, when this kind of paralysis has been most completely produced by the division of the spinal marrow, or of nerves near their origin, the effects of active poisons ap-

plied to wounds in the part are not intercepted, although it has been shown by the experiments of Dr. Addison and J. Morgan, already noticed, that the operation of the poison, is not to be ascribed to its introduction into the circulation. To explain this difficulty, recourse has been had to branches of nerves derived from the sympathetic system, and supposed to accompany the branches of the vascular system. Still, however, nothing is known of these branches, and we have no direct experiments to throw any certain light on their functions. The observation respecting the influence of these nerves on the function of absorption, founded on the experiments of John Hunter, and others, offered at p. 371 of the Thesis, may, perhaps, be regarded as an approach to an experimental inquiry into the subject. The intestines being solely supplied by nerves of the sympathetic system, and the facilities which they offer for the division or the ligature of these nerves, render them rather peculiarly adapted for this investigation. Though no positive conclusions can be drawn without the assistance of a greater number and variety of experiments, yet those which have been adverted to, seem, at least, to indicate the probability, that the vessels, when unassisted by the nervous influence, lose much of their power of selection. Numerous experiments have been made upon the division of the eighth pair of nerves, with the hope of obtaining some light on the subject of nervous influence. But although these nerves offer some manifest advantages for experiment, from their size and distinctness, and the readiness with which they can be divided, with comparatively little injury to other parts, and the character and importance of the functions of those parts to which they are distributed, yet it appears to me, that they are liable to some decided objections. It is evident that they have so complex an origin, that it is impossible to say, whether, at the point at which

division is to be made, the fibrillæ belong more to the motive, or the sentient nerves. The gangliform enlargement, which is sometimes very evident at the upper part, would seem to place them amongst the sentient nerves, and favour the suspicion as to their function, noticed at p. 350. On the other hand, this nerve did not appear in the experiments of my friend, S. D. Broughton, to be possessed of sensibility; and the experiments of Drs. Wilson Philip and Hastings, and those of Dr. Milne Edwards, and others, exhibit this nerve as acting by virtue of an influence directed from the brain to the branches, and in this respect more allied to the motive, than to the sentient nerves. Dr. Holland, although an opponent to the views of Dr. Philip, at least, agrees with him in this respect, and regards this nerve as communicating an influence to the lungs, by which the circulation of the blood through them is promoted. The disturbance of respiration, and digestion, accompanied by an accumulation of mucus in the lungs, and the alteration of the secretions of the stomach, which succeed the division of the eighth pair of nerves, he regards as secondary to the interruption of the circulation through the lungs, which is a direct effect of the division. The destruction of different parts of the brain, and spinal marrow, does not appear to have thrown any certain light on the influence which the nerves exert upon the circulation through the capillaries, in which their chemical agency is chiefly exerted. It appears evident, that this destruction produces a disturbance in this part of the circulation; but the experiments of Dr. Marshall Hall have shewn, that the same effect is produced by the sudden destruction of other parts; as for example, the stomach. This interesting fact, as well as the operation of poisons inserted into a wound, seems to point at a kind of sympathy, or consent of parts, with which we are at present wholly unacquainted.

Dr. Foville has recently advanced some highly interesting observations and speculations, concerning the joint agency of the extreme branches of vessels and nerves, which have been greatly admired by some of the ablest physiologists in France, and which will, I hope, before long be laid before the public.

Page 378. That the production of black matter is promoted by the retardation, or stasis of blood in the vessels, as suggested in the Thesis, appears to be strongly confirmed by the effects of inflammation. It not unfrequently leaves the small vessels of the part affected, distended with blood, after the activity of the circulation through them has ceased; this is strikingly the case with the mucous membrane of the alimentary canal, in which the production of black matter from this cause is by no means unfrequent. In some instances we may notice the different shades of colour which attend the transition from red or purple to black. This colour, and various shades connected with it, have been regarded by some distinguished foreign pathologists as evidences of the existence of chronic inflammation, I would rather regard them as proofs that inflammation had subsided. Though it is not my intention to pursue this pathological subject further in this volume, I wish to correct an error into which I have been led, in representing this black pigment as a frequent occurrence in the spleen. Though I made this statement in consequence of my own personal observation in dissecting-rooms, the numerous opportunities which I have since had of the inspection of recent subjects, have convinced me that, except to a limited and partial extent, the deposition of this pigment in the spleen, is by no means common. Although I retain unchanged the opinion, that the black matter of the lungs is generally produced in the system itself by the alteration of the blood, in opposition to

the view of Dr. Pierson, who ascribed it to inhaled carbonaceous matter, I cannot omit to notice a fact which has been since observed by my friend, Dr. Gregory of Edinburgh. He found the lungs of a patient, who had been long engaged as a coal-miner, unusually loaded with black matter. A specimen of this matter was subjected to a careful analysis by Dr. Christison, the result of which rendered it almost certain, that the black matter was in part, at least, composed of minute particles of coal.

Page 380. That the circulation of the blood is promoted by the way in which it is disposed of in the extreme vessels, is a view which I am still disposed to entertain. It seems to receive the support of analogy from the observations of Dutrochet, respecting the motion of the sap in the roots, and branches of vegetables.

OF THE PHÆNOMENA TO WHICH THE NAMES ENDOSMOSIS AND EXOSMOSIS HAVE BEEN GIVEN BY H. DUTROCHET.

SINCE the publication of some of the preceding views respecting transudation and inbibition by Magendie and Fodera, the subject has been very carefully investigated by Dutrochet, who, in examining the transmission of different fluids through different kinds of thin and slightly porous septa, has thrown much light on the phænomena attending this transmission, and exhibited what appears to him to be a new physical force distinct from ordinary capillary attraction, electric agency, and hydrostatic pressure; to the movements resulting from this force, he gives the names of endosmosis or exosmosis, according to the direction.

Whether this force be altogether distinct and *sui generis*, or a modification of some principle, with which we are already partially acquainted, it seems to operate very generally throughout living and dead, and organic as well as inorganic matter, and as an agent intimately connected with some vital phænomena, it must not be wholly passed over in this volume. If we take a membranous sac or cavity, as for example, the cœcum of a fowl, or the air-bladder of a fish, and having put a small quantity of fresh milk into it, and secured the mouth by a ligature, we shall find on immersing this sac in water, that in the course of a few hours it will become quite full, and eventually turgid. This turgidity is not permanent, and after a few hours more have elapsed, the sac will again be flaccid. If the sac be now opened, it will be found to contain curdled and putrid milk; if the sac be cleansed from this offensive substance, and again partially filled with

milk and immersed in water, we shall find a repetition of the phænomena, but the sac will neither become so turgid nor so long remain full as in the first instance; this may be repeated several times, but with diminished effect. It does not make any sensible difference to the experiment, whether the sac be inverted or not, or whether the mucous or peritoneal coat be removed. If instead of milk some other fluid be employed, similar phænomena may be observed, but by no means in the same degree in all; in fact, very striking differences may be observed, depending on the nature of the fluids within and without the sac, as well as upon the texture through which they have to pass. All these points have been carefully investigated by Dutrochet. In this enquiry, instead of a fowl's cœcum, or fish's bladder, he employed an instrument, to which he has given the name of an endosmometer, which it will be necessary briefly to describe. It consists of a cylindrical tube of glass, to which is fitted at one extremity, a sort of moveable funnel, or cupola, having such a rim, or lip, as will admit of a firm attachment of the membrane, or other material, by which this aperture is to be closed, and though the transmission of endosmosis and exosmosis is to be examined, the other extremity of the tube is left open, and a graduated scale is applied to the tube itself: the fluid of which the power of producing endosmosis is to be tried, is placed in the reservoir formed by the closed funnel, after which the tube is applied and the funnel immersed in water. If endosmosis take place, the fluid will rise in the tube above the level of the water surrounding the reservoir, and the amount of this elevation may be read off from the graduated scale. In this way Dutrochet discovered a very considerable difference in the power of different fluids in inducing endosmosis, and it appeared that in general this power was greater in dense

than in thin fluids. Solutions of sugar and of gum arabic possessed this power in a very remarkable degree; the former, when of the strength of one part sugar to three of water, producing an elevation in a column of quicksilver of 258 millimeters, or 45 inches 9 lines, French; and the latter, when of the same strength, an elevation of more than 28 inches. Saline and alkaline solutions have also considerable endosmodic power. Dutrochet, at one time, conceived that the acids were unfriendly to endosmosis, or rather that they produced exosmosis, and he was in consequence induced to attribute the phænomena of this kind of transmission to electric, or galvanic agency; and this opinion seemed to be strengthened by the results of various experiments, which he instituted to endeavour to ascertain the fact. Further experiments led him to abandon the idea of electric agency, and he discovered moreover, that most of the acids really possess some power of producing endosmosis; sulphuric acid however continued to form a marked exception.

Dutrochet likewise tried many of the animal fluids besides milk, and he found that they also possessed considerable energy in producing endosmosis, until, as in the cases of the milk in the preceding experiments, they had become putrescent. In this state he found that all the animal fluids were opposed to endosmosis. By varying his experiments and employing other fluids free from animal matter, but containing sulphurated hydrogen, as for example, the hydro-sulphuret of ammonia, he discovered that this principle, like sulphuric acid, is decidedly opposed to endosmosis; but he states, that we are at present completely ignorant of the mode in which these two principles, the only known sedatives of endosmosis, act. In observing the differences in the phænomena of endosmosis presented by different fluids, there are two points to which Dutrochet

turns his attention, viz., the force and the rapidity of endosmosis, both of which may be made the subject of actual measurement. The rapidity he appreciated by the number of millemeters through which the fluid in the tube ascended in successive hours. In order to estimate the strength, he employs an endosmometer of a form somewhat different from that before described. It is constituted on the same principle as the apparatus by which Hales estimated the force exerted in raising the sap of the vine. The reservoir of this endosmometer is similar to that used in the former experiments; but the tube is bent so as to form a syphon with its convexity upwards; the descending leg of this syphon fits one of the legs of another, which has its convexity downwards. Mercury is put into this second syphon, and the force of endosmosis being exerted on the quicksilver in one leg, produces a corresponding elevation on the mercury in the other, when it may be read off on a graduated scale. By trying the rapidity and force of endosmosis on different fluids, by the use of these instruments, Dutrochet found, as might have been anticipated, that those fluids which acted with the greatest rapidity, likewise acted with the greatest force; and he also found, that the power of endosmosis, in these two respects, increased with the specific gravity of the fluids; provided that we estimate this only by its excess above the specific gravity of water.

The following are some of the most remarkable differences depending on the nature of the substance through which the transmission takes place. It may be seen from the experiments performed on milk, and the intestines of a fowl, that at each successive repetition of the experiment with fresh milk, but the same portion of intestine, the amount of endosmosis continued progressively to decrease: this appeared to depend upon decomposition taking place in the membranes themselves, by which they became infil-

trated with a fluid, containing one of the principles which has been already remarked to be negative of endosmosis. Conducted by this fact, Dutrochet was led to the observation, that the transmission of fluid through a septum, by the influence of endosmosis, was very materially influenced by the fluid with which it happened to be pervaded. When the septum was dry, and the pores consequently filled with air, endosmosis was obstructed. This obstruction was removed as soon as the septum was saturated with water, and it became greatly increased, when, instead of water, a fluid favourable to endosmosis, such as a solution of sugar, or gum, occupied the pores of the septum. Various materials, besides the membranous parts of animals and vegetables, were employed to close the funnel of the endosmometer, such as very thin plates of sand-stone, plaster of Paris, lime-stone, burnt slate, and the biscuit of earthenware; with some of these substances, the endosmosis was carried on with considerable energy, whilst with others, it seemed totally inactive: this evidently did not depend on the mere porosity of the material employed, and satisfactorily showed that the phænomena of endosmosis must not be confounded with capillary attraction; very little, if any, endosmosis was observed to take place through plates of sand-stone, whether the most porous, or the least porous were employed, but the presence of a little ferruginous matter in one of the specimens was observed to favour it. To ascertain, that in instances in which endosmosis took place, there did not exist a physical impediment to the transmission of fluids, Dutrochet tried them both with the pressure of a column of fluid, and with the galvanic current, and in these cases he observed transmission to take place. The septa of lime-stone, though sufficiently porous to allow the passage of fluids and to exert a capillary attraction upon them, were found to be extremely unfriendly to

endosmosis; but those of burnt slate, and baked clays, though but little promising, were observed to exhibit, endosmosis, strongly.

In some of these experiments it was remarked, that after the endosmosis had been carried on with considerable activity in several trials with the same septum, a diminution in the transmission took place, indicating that some impediment had interposed itself; this was discovered to proceed from an accumulation of the gum, sugar, or other principle in solution upon the surface of the plate or septum.

As respects the fluid, in which the reservoir of the endosmometer is immersed, it would seem, that there is no fluid more favourable to endosmosis, and at the same time so convenient for experiment, as pure water. The examination of this fluid, after it had been for some time employed, afforded convincing evidence of a very curious fact. Notwithstanding the copious and forcible transmission of water through the septum, occasioning in some instances an elevation of several inches in the tube, there is likewise, at the same time, a transmission of fluid in an opposite direction; thus, if a solution of muriate of soda be employed in the endosmometer, it will not be long before traces of this salt will be found in the water surrounding the reservoir of the instrument.

Dutrochet has been remarkably ingenious and happy in the application which he has made of the principle of endosmosis and exosmosis, to the explanation of many curious points of vegetable physiology. The cause of the motion of the sap, which has led to so much interesting investigation and controversy, he attributes, in a great measure, to a structure situated near the junction of the root and the stalk, in the minute cells of which, a powerful endosmosis is exerted. The peculiar firmness which forms so

striking a distinctive character between a fresh and a living leaf, or other vegetable tissue, and the permanent flaccidity of that which is dead, he designates by the term turgid state, and refers it to endosmosis filling the cells of the vegetable structure, and induced by the nature of the fluid in these cells. Hence, a faded, but still living plant, is rapidly restored by immersion in water, and this experiment may be repeated until the death of the plant, has allowed such an alteration of the fluid remaining in the cells, that endosmosis is no longer provoked. Even when this condition has been arrived at, Dutrochet has succeeded in procuring an artificial turgid state, by causing the cells to imbibe solutions favourable to endosmosis. The forcible ejection of the juice from the fruit of the elaterium is referred, by Dutrochet, to the progressive operation of endosmosis, in conjunction with a peculiar arrangement of the cells, of which the substance of the fruit is composed. Many curious speculations have been formed respecting the cause which determines the direction of the roots and the stalks of plants. That which has been offered by Dutrochet, is, perhaps, the happiest application of endosmosis, which he has yet pointed out. From a difference in the arrangement of the cellular structure in the stalks and the roots, it seems to follow as an inevitable consequence, that the turgid state induced by endosmosis, will cause the first to form a curl with its concavity upwards, and the latter with its concavity downwards, until the one has acquired an ascending, and the other a descending direction.

Dutrochet thinks, that the same principle of motion may be applied to the explanation of the curious phænomena presented by the *balsamina impatiens*, the *hædysarum girans*, and the *mimosa pudica;* but in the movements of this last especially, we are at fault for another yet unexplained power by which the movements are called into

play, even supposing that endosmosis is, in some way, immediately concerned in producing the temporary turgidity of the cellular organs, placed at the angles formed by the moving joints of the plant. But if, as Dutrochet very candidly admits, something be wanted in the explanation of the movements of the sensitive plant, this difficulty is much more strongly felt in the movements performed by animal life. Their nature and rapidity seem completely at variance with any explanation founded on endosmosis; they are opposed by the experiments of Blanc, Burzoletti and Prevost, and Dumas, upon muscles in action, and by the most careful and minute microscopic observation of the elementary fibre, in which nothing approaching to the vesicular, or cellular structure, imagined by Dutrochet, can be discovered.

I am far from believing, that endosmosis and exosmosis, are not actively concerned in many of the phænomena of animal life; but in applying them, we must be extremely careful not to ascribe too much to them, to the neglect of other forces, which nature employs in living animals to restrain and modify their influence. I have had occasion to notice a similar error into which, I apprehend, both Magendie and Fodera have been led, with reference to the phænomena of transudation and imbibition. It is doubtless extremely difficult to decide, how much may correctly be attributed to any of the different forces which take a part in the various and complicated operations of animal life, and it is only as a conjecture, that I notice the following instances, in which it seems probable, that the principle pointed out by Dutrochet may be concerned. When we consider the great increase in the quantity of urine, which takes place in conjunction with the production of sugar, in those who are labouring under diabetes, and consider the strong power of endosmosis, which Dutrochet ascribes to

sugar, may we not attribute the accumulation of a part of the superabundant fluid to this cause, and even suspect, that not in the kidneys alone, but throughout the urinary apparatus, endosmosis may add to the bulk of secreted urine? This idea, as respects the bladder at least, has, prior to the publication of Dutrochet's views, had the sanction of some distinguished physiologists, who have contended, that even in the healthy state, much of the fluid passed from the bladder is so collected.

Some proof that the excessive quantity of the secreted urine is influenced by the presence of sugar, is afforded by the fact, that if by strict exclusion of vegetable matter, the production of sugar may be suspended for a time, the quantity of fluid evacuated will exhibit a corresponding diminution, notwithstanding that the disposition to the complaint remains unabated. Another instance in which the operation of endosmosis will, perhaps, be more readily admitted, since the structures concerned are adventitious, and, consequently, less perfectly organized, is furnished by the enormous cysts, which are not unfrequently formed in or near to the ovaries, constituting what is generally called, ovarian dropsy. As these cysts are furnished with no special glandular apparatus, it is not unreasonable to refer the production of the fluid which they contain, to the whole internal surface; although, for reasons which I have endeavoured to explain in a short essay on the anatomical character of some adventitious structures, and which, I need not here repeat, it is very probable that the production of fluid is not equally rapid from every part. The short space of time in which some of the largest of these sacs are refilled, after the operation of paracentesis, is no less remarkable than the character of the fluid so produced. It is well known that these fluids are copiously charged with a muco-albuminous substance, which, like sugar, must,

on Dutrochet's principles, be greatly favourable to endosmosis.

If endosmosis be admitted to take a part in those functions, in which there is a high degree of life and organization, it must be admitted, *a fortiori*, in other instances, in which organization is greatly inferior, and life nearly or quite extinct. Hence, I apprehend, we may be allowed to have recourse to its assistance to explain the changes which take place in structures which appear to be devoid of organization, or which having lost the life and organization which they once possessed, are yet still retained in the system. The copious impregnation of such substances with earthy salts, constituting what are termed petrefactions, examples of which are met with in old tubercles of the lungs, in the mesenteric glands, in the coats of arteries, and in various other situations, may, I believe, be referred to this principle.

ON THE MICROSCOPIC CHARACTERS OF SOME OF THE ANIMAL FLUIDS AND TISSUES. BY J. J. LISTER AND DR. HODGKIN.

THE researches of Prevost and Dumas, respecting the microscopic appearances of the blood, are alluded to in the work of Dr. Edwards. The very superior compound achromatic microscopes of my friend J. J. Lister, who has devoted much of his leisure time to the cultivation of this branch of optics, have enabled him and myself to correct some of the illusions into which the indefatigable physiologists of Geneva, to whom I have alluded, were unwittingly led by the imperfection of their instruments. Hence, it appears, that there would be an obvious advantage in reprinting in this work, with some few additions, the observations which have already been published in the Annals of Philosophy, and in the Catalogue to the Anatomical Museum of Guy's Hospital.

Any approaches towards a more accurate knowledge of the intimate structure of organized beings, may reasonably be looked to as collateral aids to our acquaintance with the influence of physical agents on life.

Very soon after the invention of the microscope, it was ascertained, that the blood, instead of being homogeneous, consisted of a fluid with coloured particles suspended in it. This discovery is attributed to Malpighi; but it does not appear that his inquiries into this subject were pushed to any great extent.

Observations similar in their result, but far more numerous and minute, were made nearly at the same time by Lewenhoeck, apparently without any connexion with those of Malpighi.

This indefatigable Micographer, describes the coloured particles of the blood as circular, or spherical, while at rest, but elliptical when in motion. Those of fish, he states to be flat and elliptical; and he remarked, that in the fluids of some insects, the particles were of a green colour. He believed rather than demonstrated, that each globule of the blood was composed of six subordinate globules.

For a considerable time the opinions of Lewenhoeck were generally received, and physiologists and micographers, amongst whom we may notice Fontana, taught that the particles of the blood were globular.

Haller in one part of his works concurs in this opinion, but doubts their form being susceptible of change from motion. In another place, he describes the red particles of the blood as flattened, and compares them to lentils.

Senac has taken the same view of them.

De la Torre, who employed in his observations single globules of glass possessed of very high power, but defective in point of clearness, recognized the flattened form of the particles, but mistaking the shaded spot in their centres for a perforation, he described them as rings. He believed them to be jointed, and to break regularly into seven pieces.

De la Torre was soon followed by Hewson, who, together with improved instruments, brought a large stock of ingenuity and perseverance into the inquiry.

To obviate the confused view, which the large proportion of the particles in undiluted blood is very apt to produce, he introduced the plan of mixing it with fresh serum,

being well aware of the change of form produced by the addition of water.

He states that if, after this change is effected, a drop or two of a neutral solution be added before the bursting of the vesicles, the flat figure will be restored.

He found no central particles in the blood of the splenic vein.

Without entering into the numerous and in many respects accurate observations of Hewson, since we shall have occasion to refer to them in a subsequent part of this paper, it will be sufficient to recall to memory the results which he drew, as to the nature and figure of the particles.

He satisfactorily shewed that they are not globular, but flattened, as well when circulating in the vessels of the living animal, as when drawn from the body; and he also proved the fallacy of De la Torre's views with respect to a central perforation.

He believed the dark central spot to be a solid particle, contained in a flat red vesicle, whose middle only it occupied, and whose edges were hollow and either empty, or filled with a subtile fluid. He observed the flattened vesicles to become spherical, by the addition of water, and at the same time to be contracted in their diameters.

He states, that the middle particle may be seen to fall from side to side in the hollow vesicle like a pea in a bladder, or sometimes to stick to one part of the vesicle. The middle particles are less easily soluble than the flat vesicles which contain them, and a little time after the proper quantity of water being added they disappear, leaving the middle particles which appear to be very small.

He states them to be larger in the immature young, than in the perfect animal.

He likewise observed them to be of the same form, when

circulating in the vessels during life, as when escaped from them, and denies that they alter from resistance during circulation.

This view of the structure of the particles, was founded on the examination of the blood of the skate of the larger size, and elongated form, of which he was perfectly aware. He admits, that it is more difficult to gain a sight of these appearances in the blood of man, but tells us that he had, notwithstanding, distinctly done so with the help of bright and clear day-light.

Falconar, by whom Hewson's Observations were repeated and published; and also Dr. Wells, entertained similar views respecting the figure of the particles of the blood.

Cavallo believed, that they consisted of double spheres.

The concise but pertinent observations of Dr. Young, claim particular attention and respect. The particles of the blood of the skate, from their superior size, are considered by him, as they had been by Hewson, as the best suited for the commencement of the investigation.

He describes them as exhibiting an oval and flattened form, and containing a nucleus generally round, but sometimes a little irregular, which occupies a nearly permanent position in the centre of the particle. It often remains distinctly visible, while the oval part is scarcely perceptible, and as the portion of blood dries, becomes evidently prominent. This nucleus is about the size of an entire particle of the human blood, the whole oval being about twice as wide, and not quite three times as long. The nucleus is very transparent, and forms a distinct image of any large object which intercepts a part of the light by which it is seen, but exhibits no inequalities of light and shade that could lead to any mistake respecting its form.

Having given these remarks respecting the particles in the blood of the skate, he proceeds to those of human blood,

of which he says, that if placed under similar circumstances in the field of the microscope, near the confine of light and shade; although they are little if at all less transparent, one immediately sees on the disk an annular shade, which is most marked on the side of the centre on which the marginal part appears the brightest, and consequently, indicates a depression in the centre; but the Doctor was not quite decided, whether this apparent depression might not depend on some internal variation in the respective density of the particle. He thought the axes about $\frac{1}{3}$ or $\frac{1}{4}$ of the diameters, but the particles never appeared to him to be "as flat as a guinea." He never observed a prominence on the outline of the particles of human blood, but he remarked, that when they had been kept for some time in water, and a little solution of salt was added, their form and structure are more easily examined, and that they appear to resemble a soft substance with a denser nucleus, not altogether unlike the crystalline lens with the vitreous humour as seen from behind; but with respect to a central particle detached within a vesicle, like a pea in a bladder, he is satisfied that Hewson was completely mistaken. The colouring matter, according to the Doctor's view, does not appear to be a mere superficial layer, but imbues the substance of the particle from which water extracts it, and occasions such a loss of specific gravity that they remain suspended instead of sinking in that fluid. In this state they easily escape observation, which circumstance, together with their passage through filtering paper, has led to the monstrous assertion that they are soluble in water. When they have been long kept in water, and even after putrefaction has taken place, they do not appear to become constituent parts of an homogeneous fluid.

In the memoirs of Sir E. Home and Bauer relating to

the subject before us, we find the globular figure of the blood again maintained.

The colouring matter appeared to them not to be contained in the particles, but rather to envelop them. They describe it as separating very readily, and flowing from all parts at the same instant. "To examine them," say they, "in their coloured state, a very small quantity of blood must be examined at once, and this must be spread as thinly as possible that the moisture may instantly evaporate, they then remain of their full size and colour, perfectly spherical. They seem to consider the flattened form as the effect of a change which takes place after death; for Bauer observes, in opposition to the assertion of Hewson, that in the skate, the particles during life are of the form of an egg, but that almost immediately after death they are flattened.

If the quantity of blood under examination be sufficiently large to retain its moisture only half a minute, the colouring matter in a few seconds begins to separate and form a circle round the globules. If the blood be diluted with water, the separation is instantaneous. They give the diameter of the globule, enveloped in its colouring matter, as $\frac{1}{1700}$, and when deprived of it, as $\frac{1}{2000}$. Elsewhere they state the proportion of the colouring matter to the globule to be as three to one. They describe the globules, when separated from the colouring matter, as being mutually attracted and coalescing with some disposition to linear arrangement, which is not the case so long as the coloured envelope remains attached; they further describe globules in pus, in muscular fibre, and in the substance of the brain, identical in point of size with the uncoloured globules of the blood.

The more recent and extended researches of Prevost and Dumas tend in some respects to confirm the opinions of

Hewson, while in others they more nearly coincide with those of Sir E. Home and Bauer.

They represent the particles of the blood as circular in all the mammalia, and elliptical in birds, reptiles, and fishes, but flattened in all, though a little prominent at the centre. Their size is uniform in the same animal, but differs in different species, from $\frac{1}{35}$ of a millimetre in the salamander, to $\frac{1}{120}$ in the callitriche, or $\frac{1}{288}$ in the goat. They regard them as consisting of a central colourless globule of one uniform size, $\frac{1}{300}$ of a millimetre, in all classes of animals, like those of chyle, milk, and pus, and inclosed, as before stated by Hewson, in a coloured membraneous vesicle, on which depends the difference in the form and size of the particles.

In those animals whose blood has elliptical particles, the nucleus appears also elliptical until muriatic acid is added, by which they conclude, that the surrounding matter is dissolved and removed. The nucleus has then the same appearance as that of the mammifera.

By repeated examination of the blood whilst in the course of circulation, these physiologists satisfied themselves that the particles possess the same size and form whilst in the vessels, as they do when recently drawn from the body. They deny that they perform a movement of rotation on the centres; but in describing the effect produced on the form of the particles from occasional resistance which they meet with, they confirm the remark of Lewenhoeck as to the elongation of the particles during circulation.

In our examination of the particles of the blood, we have in vain looked for the globular form attributed to them, not only by the older authors, Leeuwenhoeck, Fontana, and Haller, but still more recently by Sir Everard Home and Bauer. Our observations are also at variance

with the opinion long since formed by Hewson, that these particles consisted of a central globule inclosed in a vesicle composed of the coloured part, and which, though refuted by Dr. Young, has since, in a modified form, been revived by Sir Everard Home and Bauer in this country, and by Prevost and Dumas on the Continent. We have never been able to perceive the separation of the colouring matter, which our countrymen have described as taking place in a few seconds after the particles have escaped from the body; nor can we with Prevost and Dumas, consider the particles as prominent in the centre.

The particles of the blood must unquestionably be classed amongst the objects most difficult to examine with the microscope; partly from the variations of form to which their yielding structure renders them liable, but still more from their being transparent and composed of a substance which, as Dr. Young has remarked, is probably not uniform in its refractive power.

These causes of error we have endeavoured to counteract by varying the mode of observation. We have viewed the particles both wet and dry, both as opaque and as transparent objects, under great varieties of power and light, and we lay no stress on observations which have not been confirmed by frequent repetition.

To us the particles of human blood appear to consist of circular flattened transparent cakes, which, when seen singly, appear to be nearly or quite colourless. Their edges are rounded, and being the thickest part, occasion a depression in the middle, which exists on both surfaces. This form perfectly agrees with the accurate observations of Dr. Young, that on the disks of the particles there is an annular shade, which is darkest on that side of the centre on which the margin is brightest. Though the Doctor drew the obvious conclusion that the disks were concave, he does not

consider the fact as demonstrated; since the appearance might be produced by a difference in the refractive power of different parts of the corpuscle.

This objection we think completely met;

1st. By their transmitting the erect image of any opaque body placed between them and the light, precisely as a concave lens would do.

2dly. By the appearance presented by the particles when viewed dry, as opaque bodies. When illuminated by the whole of a Leiberkuhn, the entire margin is enlightened, and in most of the particles there is besides a broad inner ring of considerable brightness; whilst the centre, and the space between the two rings, is completely dark. On half the Leiberkuhn being covered, the rings are reduced to semicircles, the outer one being opposite to the light side, and the inner to the darkened side of the speculum.

3dly. When fluid blood having been placed between two slips of glass, a single particle happens to be at right angles to the surfaces of the glass, so as to be seen in profile, the two concave surfaces are visible at the same time,* or alternately, but more distinctly, if the particle slightly vacillates.

The concavity of the disks is, however, extremely trifling; and under particular circumstances, in a few of the particles, the surface is to all appearance quite flat.

Notwithstanding the great uniformity in the size of the particles of the blood, so long as they retain, unimpaired, the form which they possess on escaping from the body, their real magnitude has been so variously estimated, that we judged it worth while to attempt a new measurement. In doing so, we adopted a method somewhat different from

* This happens notwithstanding the interposition of the edge, when the centre of the particle is accurately in focus, owing to the large pencil of light admitted by the object glass.

those hitherto employed. A camera lucida is adapted to the eye-piece of the microscope in such a manner that the distance of the paper being ascertained, the object may be drawn on a known scale. Tracings of several of the images being made, they were applied to, and compared with, the images of other particles until their accuracy was established.

The diameter of the particles obtained in this manner may be pretty correctly stated at $\frac{1}{3000}$ of an inch.

The following measurements by former observers are given for the sake of comparison.

Jurine	$\frac{1}{5240}$
Jurine in a 2d measurement	$\frac{1}{1940}$
Bauer	$\frac{1}{1700}$
Wollaston	$\frac{1}{3000}$
Young	$\frac{1}{6060}$
Kater	$\frac{1}{4000}$
Ditto	$\frac{1}{6000}$
Prevost and Dumas	$\frac{1}{4076}$

The thickness of the particles, which is perhaps not so uniform as the diameter of the disks, is on an average to this latter dimension as 1 to 4.5

The form and size of the particles of the blood of other animals have frequently been compared with those of man. Many observations were made for this purpose by Hewson; but while some of them appear tolerably accurate, others are decidedly far from the truth. Those which have recently been made by Prevost and Dumas, are the most extensive and complete which as yet exist. Our attention having been chiefly taken up with the blood of man, we have not as yet carried our investigation of that of other animals so far as we design doing; we have, however, examined the

blood in all the classes of vertebrated animals, and in different species of most of them. Our observations completely accord with those of Prevost and Dumas, as to the particles having a circular form in the mammalia, and an elliptical one in the other three classes. There are varieties both in the size and proportion of the particles in different species. Thus for example, in the pig and rabbit, the particles have a less diameter, but a greater thickness than in man. We have hitherto invariably found the elliptical particles larger than the circular, but they are proportionably thinner. In birds, the particles are much more numerous, but smaller than in either reptiles or fishes.

There are numerous interesting phænomena which present themselves when the particles lose their integrity and assume new forms. Changes of this description are occasioned by the spontaneous decomposition which the blood undergoes a longer or shorter time after its escape from the body, by mechanical violence, and by the addition of various substances, which appear to exert a chemical action on the matter of which the particles are composed. To these appearances we have been induced to devote the more attention, from their seeming calculated to throw some light on the composition and structure of the particles. We were also desirous of not hastily or rashly denying the existence of those colourless central globules which have been strongly insisted on by Sir Everard Home and Bauer, and by Prevost and Dumas, and which have been regarded not merely by themselves, but by other distinguished and intelligent physiologists, as constituting by their varied combination the different organic tissues. The separation and detection of these globules is stated to be facilitated by some of the means which effect the changes to which I have alluded ; but, as I have already stated, we have in vain looked for these globules.

After blood taken from the living body has been kept a sufficient length of time for an alteration in the form of the particles to commence, and this according to circumstances will be from a very few hours to one or more days, the first change which we have noticed is a notched or jagged appearance of the edge of a few of the particles. The number so modified continues to increase: some of the particles lose their flattened form, and appear to be contracted into a more compact figure; but their outline continues to appear irregular and notched, and their surfaces seem mammillated. Hewson and Falconar appear to have accurately noticed this change, and have compared the particles in this state to little mulberries. When more time has elapsed, most of the particles lose this irregularity of surface and assume a more or less perfectly globular form, and reflect the image of an interposed opaque body as a convex lens would do. Some of the particles resist these changes much more obstinately than others.

If a small quantity of blood be placed between two pieces of glass, which are afterwards pressed together with some force, several of the particles, however recent the blood, will be materially altered. The smooth circular outline is lost, and as in the former case, they appear notched. A few seem to be considerably extended by the compression. When the surface of the particles has in this way been broken into, the ruptured part exhibits an adhesive property capable of gluing it to another particle or to the surface of the glass; but the particles in their natural state, seem to be nearly void of adhesiveness.

There is scarcely any fluid except serum which can be mixed with the blood without more or less altering the form of its particles, probably in consequence of some chemical change. In this general result our observations accord with those of Hewson and Falconar, whose experiments of

this kind were very numerous. We differ from them, however, in a few particulars. There is no fluid which, when mixed with the blood, produces a more remarkable and sudden alteration in the appearance of the particles than water does. With a rapidity which, in spite of every precaution, the eye almost invariably in vain attempts to follow, they change their flattened for a globular form, which from the brightness and distinctness of the images which they reflect as convex lenses, must be nearly perfect.

Contrary to Sir Everard Home's remark, that the particles in their perfect and entire state are not disposed to arrangement, it is in this state only that we have found them run into combinations, which they assume with considerable regularity. In order to observe this tendency of the particles, a small quantity of blood should be placed between two slips of glass. In this way the attraction exerted by one of the pieces of glass, counteracts that of the other, and the mutual action of the particles on each other is not interfered with, as is necessarily the case when only one slip is employed.

When the blood of man, or of any other animal having circular particles, is examined in this manner, considerable agitation is at first seen to take place amongst the particles; but as this subsides they apply themselves to each other by their broad surfaces, and form piles or *rouleaux* which are sometimes of considerable length. These *rouleaux* often again combine amongst themselves, the end of one being attached to the side of another, producing at times very curious ramifications.

When blood containing elliptical particles is examined in the same manner, it exhibits a not less remarkable but very different mode of arrangement. Though they are applied to each other by some part of their broad sides, they are not so completely matched one to another, as is the case

with circular particles; and instead of placing themselves at right angles to the glass, with their edges presented to its surface, they are generally seen nearly parallel to it, one particle partially overlaying another, and their long diameters being nearly in the same line. In the blood of the toad or frog the lines thus formed are subjected to a kind of secondary combination, in which several assume to themselves a common centre, whence they diverge in radii. It is by no means rare to see several of these foci in the field of the microscope at one time. The particles at these points appear crowded, confused, and misshapen. This tendency to arrangement is perhaps not to be wholly attributed to the ordinary attraction existing between the particles of matter, but is probably to a greater or less degree dependent on life; since we have not only observed that the aggregating energy is of different force in the blood of different individuals, but that in the blood of the same individual it becomes more feeble the longer it has been removed from the body. At the same time, we are very far from believing that these or any other mode of aggregation which the particles of the blood may be observed to assume, ought to be regarded as at all analogous to the process which nature employs in the formation of the different tissues.

I some years ago briefly stated this opinion, which I was induced to form *a priori**; but I may now appeal to facts in support of it.

Besides the particles above described, and which are evidently very important and essential constituents of the blood, other particles, much smaller and much less numerous, may occasionally be observed in the blood. They are circular, and perhaps globular, but we have not made them the subject of much examination.

* See "Thesis de Absorbendi Functione." Edin. 1823; and this Vol. p. 377.

We have not made many observations with a view to discover any microscopic differences between the blood of healthy and diseased persons. We have in general seen no perceptible difference between blood obtained from a small puncture expressly for the purpose of observation, and a portion of a larger quantity drawn from the arm to relieve some affection requiring venesection. There is some difference in the tendency of the particles to combine in piles, or *rouleaux*, but of the cause of this, we can suggest no explanation. The absence of this disposition to combination was most remarkable, and indeed almost complete, in a small quantity of blood taken from the arm of a young woman labouring under strongly marked chlorosis. This blood coagulated with little or no contraction of the crassamentum, which was covered with a thin buffy coat of a remarkable colour, somewhat resembling weak coffee diluted with milk.

The striking appearance in the blood of patients affected with cholera, has recently rendered its examination an object of some interest. In a specimen of this blood, furnished me from the City Cholera Hospital, by my friend Alexander Tweedie, the particles possessed their form, and other characters completely unaltered, notwithstanding that the blood had unavoidably been drawn a few hours before the examination was made.

We have observed in the blood of some individuals, that several of the particles presented more or less of the notched or jagged appearance, in which they have been compared to mulberries, and which may be regarded as a symptom of decay, or disintegration; since, as has been already remarked, it is seen to take place after the blood has been for a considerable time removed from the body. In the instances to which I am now alluding, the blood was quite recent, and taken from tolerably healthy sub-

jects. In the blood of a small dog, from which the spleen had been removed several weeks, and which appeared to be in an emaciated sickly state, the particles generally seemed to have lost their natural figure, and to have been somewhat reduced in size. They likewise bore an unusually small proportion to, the watery serum in which they were suspended. In the blood of a remarkably fine doe rabbit, from which the spleen had been removed some years before by my friend Dr. Blundell, the particles did not seem quite so clear and regular in their figure, as in the blood of another rabbit examined at the same time for the sake of comparison. We are far from inferring from these two observations, that the particles of the blood are formed in the spleen, as Hewson imagined. In the first instance, their altered form may well be ascribed to the peculiarly sickly state of the dog; and in the doe, it might in part be occasioned by the state of œstrum in which she happened to be. It would be highly interesting to discover where and in what manner the particles of the blood are produced. When we consider their great uniformity as to size and figure in each species of animals, and the undeviating precision with which the rule is observed regarding their elongated figure in oviparous animals, and their circular form in those which are viviparous, we cannot help admitting some simple, but very powerful cause. We might hope to obtain some light on this subject, from the examination of the blood of a chick shortly after incubation had commenced. The presence of red blood is very distinct in the small areola of vessels belonging to the membrane of the yolk, immediately around the punctum saliens, whilst as yet, the rudiment of the spine and head, with a faint trace of the eye, and a very imperfect heart, are but just perceptible. In the very recent blood, seen whilst in motion in these minute vessels, the

particles seem to want that uniformity as to size and figure, which is so striking in the more advanced animal; yet it appeared, that they already exhibited a tendency to the elongated figure. This enquiry is one which we by no means consider as complete, but it induced a doubt in our minds, as to the accuracy of the remark of Prevost and Dumas, that the particles in the blood of an incubated egg, are of a circular figure, as in the mammalia, until the period when the existence of the liver becomes apparent. In very minute animals quite of the lower classes, in which the vascular system is neither extensive nor complicated, and in which the channels for the conveyance of the nutrient fluid are proportionably of large diameter, the particles are not only comparatively rare, but very irregular as to size and figure, and even in colour. Although we hardly feel ourselves warranted in admitting a conjecture as to the mode of formation of these particles, yet we cannot help suspecting that they are much more intimately connected with their motion during circulation, than with any particular organ specially devoted to their production.

The striking changes effected in the particles of the blood, by the addition of water and other fluids, seems to merit careful attention at the present period, when the copious dilution of the blood is had recourse to, with the hope of counteracting the formidable symptoms of cholera. The great, sudden, and general alteration, caused by the mixture of pure water, would seem to render this fluid one of those which are the most to be dreaded. Saline solutions, on the contrary, have the recommendation of producing very little alteration of figure in the particles.

Chyle.—We have as yet devoted very little time to the microscopic examination of this fluid. A specimen taken from the thoracic duct of a young dog, a short time after his eating a hearty meal, was of a tolerably good white colour

when first drawn, but it rapidly acquired a light pink blush on the surface by exposure to the air. It also speedily coagulated, but the quantity obtained was too small to admit of a sensible separation of serum. A small quantity of this chyle placed between too slips of glass, as in the examination of the blood, exhibited an infinite number of extremely minute particles in a state of constant agitation.

From these two circumstances, it appeared impossible to form any precise and satisfactory idea of their figure, but they appeared pretty uniform as to size. Dilution with water and with saline acid and alkaline solutions had no sensible effect in rendering the particles more distinct; but it is worthy of remark, that whilst the solution of oxymuriate of potash manifestly heightened the pink hue produced by exposure to the air, both the acid and alkaline solutions discharged it, a fact which it may be well to consider in connexion with the observations of Dr. Stevens. A minute portion carefully obtained from one of the lacteals, before it had passed through a lymphatic gland, presented precisely the same microscopic characters as that obtained from the thoracic duct. It is to be observed, that the microscopic characters of the chyle bear no resemblance to those of milk, of which we are next to speak.

Milk.—In this fluid the particles appear to be perfect and very transparent globules. But, far from being uniform, they present the most remarkable varieties in respect to size. Whilst some are more than double, others are not a tenth part of the size of the particles of the blood, to which they bear no resemblance.

Pus.—As far as we have yet examined this secretion, its particles appear to be as irregular in size and figure as those observed in the brain, and bear no resemblance to those of the blood.

In proceeding to offer a very short sketch of the result of

our inquiries into the microscopic appearance of some of the animal tissues, I do so with one painful feeling, which I shall perhaps be excused from expressing. It is, that I am under the necessity of differing from my excellent and intelligent friend Dr. M. Edwards. It was the knowledge of his talents and address, and of the patience and care with which he made those investigations, which he has related, which induced me to enter into the examination of a question, which I had already regarded as settled in the negative. And though J. J. Lister and myself, in repeating the observations of Dr. M. Edwards, have arrived at videly different conclusions, I am confirmed in the conviction, that he described what he saw, and that he only saw amiss through the imperfection of his instruments. The idea of the globular structure of the different tissues is however by no means peculiar to Dr. Edwards, and to those micographers to whom I have already frequently alluded. Dr. Edwards, in the papers to which I refer, has employed much erudition to show that similar views had been taken, with respect at least to some of the tissues, by Hooke, Leuwenhoeck, Swammerdam, Stuart, Della Torre, Prochaska, the Wenzels Dutrochet, and Clocquet.

Muscle.—The muscular tissue may be easly seen with the naked eye, or with the assistance of a comparatively feeble lens, to be composed of bundles of fibres, held together by a loose and fine cellular membrane, and these fibres are again seen to consist of more minute fibrillæ. It is difficult to push the mechanical division much further; for the softness of the muscular substance is such, that it either crushes or breaks off, rather than admit of further splitting. If a piece of one of the most delicate of the fibrillæ last arrived at be placed on a piece of glass in the field of the microscope, lines may be seen parallel to the direction of the fibre, which show a still further division

into fibres.* Although no trace of globular structure can be detected, innumerable very minute, but clear and fine, parallel lines or striæ may be distinctly perceived, transversely marking the fibrillæ. In some instances they seem to be continued nearly or quite at right angles completely across the fibril; but frequently the striæ in one part are opposite to the spaces in another, by which arrangement a sort of reticulated appearance is produced. The striæ are not in all specimens equally distant, but this may perhaps be owing to the elongation or contraction of the fibre. We have discovered this peculiar and very beautiful appearance in the muscles of all animals which we have as yet examined; and as we have seen it in no other tissue, we have been induced to view it as a distinguishing feature of muscle.

Although this characteristic appearance may be unequivocably seen in the voluntary muscles of the smallest animals of the lowest classes; yet, with the exception of the heart in most animals, and perhaps also, the gizzards of graminivorous birds, we have been unable to detect it in any muscle of organic life, such as, *e. g.* in the muscular coat of the alimentary canal, and that of the bladder. We have not only examined these textures in their ordinary state, but also in many instances in which encreased exertion, or other causes, had greatly developed their power and bulk, as when the bladder has gained great thickness and strength from diminution of the perviousness of the urethra, and the coats of the intestine from stricture of the colon or rectum. This essential difference between the minute structure of the muscles of voluntary motion, and those of organic life, is not only suffi-

* When sufficiently moistened, either by their own juices or by the addition of water, a minute portion of muscle thus thinly extended exhibits a nacreous irridescence.

cient to warrant a more decided distinction between them, anatomically and physiologically, but is borne out by equally striking differences in the pathology of the two structures. I must not, however, enter further into this subject on the present occasion, pathology forming no part of the present work. The nature and function of the substance of the uterus has been made the subject of warm dispute: some physiologists regarding it as unquestionably and powerfully muscular, whilst others refuse it the title of muscle. It was therefore an object of no little interest to us, to avail ourselves of an opportunity of examining this structure in its state of extreme development at the full period of utero-gestation. We could not detect in it the slightest traces of that appearance which we feel warranted in regarding as universally and essentially belonging to true muscle. We could perceive no sensible difference between its fibres, and those of the middle coat of the bladder, but so far as we are warranted in speaking of the muscular coat of the bladder and intestines, are we strictly correct in attributing muscularity to the uterus. In fact, this organ in its state of complete development forms the most striking and powerful example of this distinct contactile tissue, which, in accordance to the views of Professor Blainville, we may regard as an appendage to the mucous membranes. The minute fibrillæ, which enter into the composition of the fasciculi of fibres, of which this tissue is made up, instead of presenting the transverse striæ, of which we have been speaking, are perfectly smooth. They appear to be continued to a considerable length of nearly uniform width. In some instances these fibres are nearly straight and parallel, whilst in others there is more intrlacing, and we are not sure that the fibrillæ do not unite and divide amongst themselves. In health they seem much less soft and fragile than the fibres of voluntary muscle deprived of life, and

they are manifestly susceptible of considerable distention. In some states of disease, however, these characters are completely changed. We have not been able to observe, either in the voluntary muscles, or in those of organic life, any confirmation of the ingenious theory of Prevost and Dumas, already exhibited in the Appendix in this work ; in fact, the subject of vital contractility appears to us to be as great a mystery as ever. It might have been concluded, that the beautiful transverse striæ universally met with in all voluntary muscles, was, in some way, essential to this function ; but their total absence in the fibres of the muscles of organic life, endowed with equally powerful and more extensive, though somewhat different contractility, throws a strong doubt this supposition. The views of Dutrochet, who has beautifully explained some of the movements of plants by the application of the principle of exosmosis and endosmosis, which he has so carefully developed, do not seem from our observations to be applicable to the muscular motions of animals. The remarkable movements of the *mimosa pudica*, of the *hædysarum gyrans*, and of the *balsamina impatiens*, are by Dutrochet referred to the turgid state of a specially constituted vesicular structure ; and he is disposed to attribute the muscular motion of animals to a similar mechanism.

Arteries.—The middle coat of these vessels being still regarded by some persons as muscular, we were desirous of discovering whether its minute structure was at all more favourable to such an opinion than its chemical composition. Its subdivision may be carried as far as that of any tissue ; and it evidently consists essentially of long, straight, very delicate and even fibres, which offer no more trace of those transverse striæ, which we have regarded as the peculiar characteristic of muscle, than they do of elementary globules.

The inner coat, when completely detached from other structures, and presenting the appearance of a very thin uniform and almost transparent membrane, is also, by the aid of the microscope, seen to be composed of fibres, which are extremely delicate, smooth and uniform, but very tortuous and matted together, in the form of an intricate plexus.

Nerves.—These appear to be essentially composed of fibres, but their structure is looser than that of muscle. Though the fibres of nerves do not form such intricate plexuses as those of some other tissues, their course is by no means straight. We have looked in vain for globules, as well as for any trace of medullary matter, which has been somewhat gratuitously supposed to be inclosed in the nerves.

Cellular membrane.—This tissue, when perfectly formed, appears to be composed of delicate fibres, assembled together without any apparent order of arrangement. They exhibit no more appearance of a chaplet, or string of globules, than any other of the animal tissues; they have nothing like the transverse striæ which characterize the fibrillæ of the voluntary muscles, but like those of the involuntary muscles and of nerves, present a smooth surface and nearly uniform width, though they are much less distinct than either of the last mentioned tissues. The demonstration of the fibrous structure of the cellular membrane, is opposed to the view which Meckel entertained respect-this tissue, which he has regarded as amorphous, and of a consistence approaching that of mucus, and only presenting cells, lammellæ and fibres, as the effect of the means which are taken to examine it. The opinion, however, of Meckel is not to be rejected as altogether void of foundation in correct observation; it is probably to be attributed to his having taken as specimens for examination, portions in an

incomplete state, as they occur in newly formed false membranes, which, when just separated from the serous fluid which pervades them, present no determinate arrangement, and in other respects more nearly approach to Meckel's description.

Serous membranes. — The structure of these membranes, bears the closest resemblance to that of the cellular.

Mucous membrane.— We have not been able to distinguish any decided fibrillæ, or other determinate form, in these membranes; but our examination of this tissue has not been completed.

Brain.—If there is any organized animal substance which seems more likely than another to consist of globular particles, it is undoubtedly that of the brain. Our examination of it has as yet been but slight; but we have noticed that when a portion of it, however fresh, is sufficiently extended to allow of its being viewed in the microscope, we see instead of globules a multitude of very small particles, which are most irregular in shape and size, and are probably more dependent on the disintegration than on the organization of the substance.

The structure of some other parenchymatous parts appears equally indeterminate, presenting neither globule nor fibre.

ON THE USES OF THE SPLEEN.

From the Edinburgh Medical and Surgical Journal, Jan. 1822.

[In reprinting the following juvenile essay, I must be allowed to remark by way of apology, that the functions it ascribes to the spleen, and which I am still disposed to admit as a part of its office, bears an immediate relation to the influence of temperature, and atmospheric pressure, two important physical agents, upon the state of the circulation. At the time it was written I was not aware, although I made considerable search and enquiry, that any similar views had been previously advanced, nor am I yet aware that the grounds on which they rest had been fully stated. The view which I have taken has since been admitted by several physiologists, and a contribution to a recent periodical publication, has reproduced the principal arguments in support of it; but, I believe, without any knowledge of the article which is here reprinted. Two opinions have likewise since been advanced; the one by Sir A. Carlisle, that it supplies warmth to the stomach, an idea which is by no means new, but which, as far as I am aware, rests on no other foundation than the antiquity, or respectability of its supporters. The second view to which I allude, is that of Sir Astley Cooper, who has carefully investigated the structure of the spleen, and by different modes of preparation, in which he singularly excels, has demonstrated the capacity of its cells in various species of animals. It is suggested by Sir Astley Cooper, that it is a part of

the office of the spleen to elaborate venous blood, and thus to assist the liver in the formation of bile. My principal reasons for doubting the accuracy of this suspicion, consists, first, in the fact, that whilst the production of venous blood necessarily attends the process by which every part of the body is nourished and warmed, it is in itself rather unfriendly than salutary, requiring the most uninterrupted provision for its removal: secondly, in the fact, that the supply of venous blood does not appear to be essential to the functions of the liver, since the vena portæ has been found passing directly to the cava.]

Amongst the objects which yet remain for our investigation, after the persevering research of a vast host of acute anatomists and physiologists who have adorned this country and the Continent of Europe up to the present day, the uses of the spleen may, I believe, still be numbered.

In entering on the consideration of this subject, Haller has said, "In meras hic conjecturas demergimur obscuriores quam fere alio in viscere." When I recollect the names of those who have already been engaged in this investigation, I am almost induced to fear that I shall be accused of presumption in attempting to meddle with it; but, on the other hand, I am tempted into a field, so far cleared by their labours.

It is, I apprehend, perfectly needless for me here to say any thing of the structure or situation of the spleen; but, before attempting to explain the office which, I conceive, this viscus is destined to perform, I may, perhaps, be allowed hastily to glance at the theories which have already been advanced. Some of them are, however, almost too ridiculous to deserve notice. One while it was considered the seat of melancholy, then of merriment; while some have held that it was connected with generation. Aristotle

thought that it received vapours from the stomach, to convert them into different fluids. Franciscus Velinus imagined that, in it, the fluids of the stomach were converted into blood; Stukely, that it acted as a sponge, and that, at will, blood might be pressed from it either into the arteries or the veins, as well as that it furnished blood to the genitals. Harrison thought it furnished a mucilaginous fluid; and Rivinus, that its secretion lubricated the viscera of the abdomen. Some have attributed to it a muscular power, by which it can compress its vessels (Willis); others, that it supplied the stomach with warmth; that it balanced the liver; or, that it rendered the blood of the vena portæ more alkaline and fluid, in order to obviate any danger of obstruction and scirrhous induration, which its slow circulation, and the deterioration it had undergone in the omentum and mesentery, might induce; that the blood acquired new properties in the spleen, by delay in its cells and large veins, and by its proximity to the fetid contents of the colon. It was the opinion of Malpighi, and, from him, revived by many others, that it prepared the blood for the formation of the bile; while others have not been wanting who denied its being of any use.

More recently, that indefatigable physiologist and anatomist, William Hewson, conceived that, in the cells of this organ, the red particles of the blood were completely formed round smaller particles, the production of the thymus and lymphatic glands. His theory has now shared the fate of its predecessors. His ideas respecting the red particles have been proved erroneous; and, though the delicate injections of Dr. Haighton have clearly shown the cellular structure of the spleen, yet these cells are not such as William Hewson had conceived them to be.

Sir E. Home, in two papers read before the Royal Society, London, in 1807 and 1808, advanced the ingenious specu-

lation, that the spleen relieved the stomach of superfluous fluids which passed into it by direct communication; though, in 1811, he withdrew this opinion, which therefore requires no further comment. I may, perhaps, be permitted to say, that the interesting experiments which he has related in these papers are not less valuable than if they had fully confirmed the views of their author. No arguments which have as yet been advanced, appear to me more strongly to support the idea, that some part of the process of absorption devolves on the veins. They likewise tend to strengthen an opinion which I have for some time entertained, and which I hope soon to bring to the test of experiment, that those fluids which are taken up by the veins are either acids, or stand similarly situated in Professor Œrsted's arrangement, while the absorbents receive those of the opposite class.

The theory which I believe at present meets with the most general support, is that of Dr. Haighton. After having proved that the blood drawn from the splenic veins does not sensibly differ, as Hewson had asserted, from that of other veins; and that the bile of an animal whose spleen has been removed, is not necessarily changed in any respect, as Malpighi has said,—Dr. Haighton advanced it as his opinion, that the spleen was subservient to digestion in another way, occasioning an increased secretion of the gastric and pancreatic fluids, at the precise time when they are most required. In explaining the mode in which this effect is to be produced, he agreed with Haller in the opinion, that the stomach, when distended with food, makes sufficient pressure on the spleen to supply its cells, and to direct the blood commonly sent to it to the stomach itself, and to the pancreas. The late lamented Henry Cline, junior, about the same time, was induced to come to a similar conclusion.

This speculation, which has deservedly gained many admirers, is not, as Dr. Blundel, the nephew and ingenious successor of Dr. Haighton, very candidly acknowledges, perfectly free from objection; noticing, at the same time, the fact, that Nature can, on occasion, supply particular organs with an increasing quantity of blood, without such a contrivance, *e. g.* the nipple, combs of cocks, &c.; that, in ruminating animals, the spleen is not connected with the digesting stomach, which ought more particularly to require its assistance; and he hence concluded, that, though the office which Dr. Haighton had assigned to the spleen is probably one of the functions which it has to perform, others may also belong to it, which remain to be discovered. Besides these objections, which are admitted by Dr. Blundel, others I think may yet be urged against Dr. Haighton's theory. It appears to me that an elastic, easily distendible bag, like the stomach, filled with a soft pultaceous mass of masticated food passing into chyme, and enclosed by the yielding parietes of the abdomen, is ill adapted to expel the blood from the innumerable spherical cells of the spleen, or to resist the flow of blood through the splenic artery. Nor, were it capable of doing this, can I conceive that it would favour the healthy secretion of either the gastric or pacreatic juices. Hæmasemesis might more naturally be expected.

Having now endeavoured to show, that all the speculations as yet advanced respecting the spleen are liable to objections, it remains for me, as briefly as possible, to explain the opinion which I was induced to form concerning this organ, when considering the subject rather more than a year ago.

The structure and situation of the spleen — the different appearances it assumes, according to the circumstances under which death has taken place — the causes which de-

range it, and the effects which it produces on the system when deranged — together with the result of experiments made on inferior animals, conspire to induce me to believe, that the spleen performs in the animal system, a similar office to that which tubes and valves of safety do in various kinds of chemical and mechanical apparatus.

The comparison may, perhaps, be thought a strange one; but, I believe, it will make my idea sufficiently intelligible when I say, that I imagine that the office of the spleen resembles that of the middle tube of a Woulfe's apparatus. By this I wish it to be understood, that the spleen tends to obviate any inconvenience which might arise from a sudden disturbance of the proportion between the capacity of the vascular system, and the fluids which circulate in it. These disturbances must, I conceive, be frequently induced by various causes to which animals are continually exposed, and which operate more powerfully than the elasticity of the vessels alone can compensate for, and more rapidly than absorption, secretion, and excretion can, in every case, counteract.

It will now be proper that I should enumerate the reasons which, if I am not mistaken, support me in this opinion.

1. The structure of the spleen.

The cells of this organ appear admirably calculated to admit, with impunity, of a protracted congestion of blood in them, which, in other parts, would necessarily be followed by consequences of the worst nature. On the one hand, these cells are sufficiently minute to bring the blood so much into contact with the solid vital parts as to remove every danger of coagulation which takes place when blood escapes from its vessels; and, on the other hand, those changes are not likely to be effected in it, at least with the

usual rapidity which takes place when the blood enters the ordinary minute terminations of vessels. In addition to this, these spherules have this advantage, that they will be less likely to yield and rupture under the sudden distension produced by the accession of a large quantity of blood.

2. The idea is not a little supported, as I apprehend, by the situation of the spleen. I have already said, that it seems improbable that it can receive from the stomach that degree of pressure which, according to the theory of Dr. Haighton, it is necessary that it should do; and here I may add, that it appears highly probable that the spleen is placed in contact with the stomach; for this very reason, that, of all the viscera of the abdomen, the stomach is the least likely to interfere with the variations of its dimensions, as well as for the sake of the protection which, in this situation, it receives from the ribs.

Not less consistent with this idea of the functions of the spleen, is its connexion with all the viscera of the abdomen, through the medium of the vena portæ, which, probably on this account chiefly, has not been furnished with valves.

3. The great variety which is met with as to the size of the spleen, has I believe been long observed, and has tended to add to the perplexity in which the function of this organ has been involved.

Should the limited observations, which it has been in my power to make with regard to this point, be confirmed by the experience of others, this variety will add support to the speculation which I have advanced. In persons who have died suffocated, I have found the spleen large and turgid; but, in a man who died from the bursting of a large aneurism, which extended from the origin of the cœliac artery quite into the pelvis, the spleen was small and flaccid.

Should such coincidence not be found to exist in all cases of death from similar causes, this circumstance alone will not amount to a refutation of my opinion; for we cannot but suppose, that, in different individuals during life, this function of the spleen must be more or less forcibly and extensively called into action, by which the growth of the organ must be affected to a degree which the circumstances occurring at death cannot, in every instance, be able to countervail.

4. Before proceeding to relate some experiments which have been made in relation to this subject, it will be as well to mention a few pathological facts which may be advanced in support of my opinion.

First, as to the causes which tend to produce disease of this viscus. Of these, none is more remarkable, and at the same time of more frequent occurrence, than intermittent fever.

In the cold stage of an intermittent, when the vessels of the surface are often suddenly diminished in capacity, and when, consequently, a large quantity of blood must be as suddenly thrown upon internal parts, an organ acting the part which I have here attributed to the spleen, must be called into unusually active service, at a time when the febrile state checks those secretions by which it is to be itself relieved, and the balance between the circulating fluid and its vessels is to be preserved. What else could we expect of an organ frequently called into excessive service of this kind, but first increased growth, and afterwards, should the cause continue to operate, derangement of structure? Those who die of ague are, it is well known, almost invariably cut off in the cold stage, and the spleen is either found prodigiously gorged with blood, or actually ruptured. More frequently, however, the complaint being less urgent,

proceeds to the derangement of the spleen, and effects are produced which I shall presently have to consider.

Another complaint which leads to the derangement of the spleen, is amenorrhœa; and the mode in which it acts, admits, I apprehend, of as easy an explanation as the preceding case, provided the functions which I have supposed be attributed to the spleen.

Secondly, A very few words will suffice with regard to the effects produced by the structure of the spleen becoming so far deranged as to disable it from fulfilling its function. Either hæmorrhage or serous effusion is, I believe, the almost invariable consequence induced, as I conceive, by the small vessels being unable to sustain the shock occasioned by a sudden disturbance of the balance between the capacity of the vascular system and the circulating fluid; which shock, in the healthy state of the spleen, is in a great degree broken by it, assisted, no doubt, by the elasticity of those vessels which have not been exposed to the constricting cause.

5. I shall now relate a few experiments on inferior animals, and then conclude.

An experiment related by the ingenious and indefatigable B. C. Brodie, in his Lectures delivered last summer at the London College of Surgeons, appears to me to strengthen my opinions, though the object for which it was instituted was not connected with an inquiry into the office of the spleen. The vena portæ of a dog was obstructed by a ligature, just as it enters the liver. After some hours uneasiness the animal died; and, on examination, the abdominal viscera, as we must conceive, would necessarily have been the case, were found charged with venous blood. This, however, was most remarkably the case with the spleen, which was gorged with blood, and prodigiously distended.

Here the spleen seems to have performed its part to the utmost; but the relief which it in its turn requires, being cut off by the ligature on the vena portæ, no exertion of its function, however considerable, could preserve life.

Though it will be quite needless here to quote all the interesting experiments of Sir E. Home, to which I have before alluded, since they have now been long before the public; yet I cannot forbear availing myself of the support which I may derive from such respectable authority, by noticing a few of the circumstances which occurred in the performance of them. Infusion of rhubarb was repeatedly given to different animals, and invariably the spleen was found turgid, and its blood impregnated with the rhubarb; and this, notwithstanding that the thoracic duct and right trunk were secured, and that the chyle exhibited no trace of the drug. Nor did the part of the canal, from which the absorption took place, appear to cause any difference, as the same results are obtained, whether the infusion was lodged in the stomach, as in the experiments made on the dogs and rabbits, or in the larger intestines, as in the ass. I would here inquire, Does not this look like venous absorption?—for what other system of vessels is there, which, in this case, could communicate at once with the stomach, intestines, and spleen?

The experiments of Sir E. Home further prove, that this passage of the absorbed fluid into the spleen, is neither at all times necessary, nor invariably taking place; for the spleen, he has since shown, may be removed without preventing the rhubarb from finding its way into the system. But I would more particularly solicit attention to the following fact. In all the preceding cases, fluids had been injected, and the spleen was full and distended. When, however, the rhubarb was given in substance, and the ani-

mal deprived of water, which was done for four days, in the case of one ass which Sir E. Home subjected to his experiments, the spleen was found contracted to half the size of what it was seen in the former experiment, and its substance was also as much condensed as that of the liver; nor did the blood from it, in such cases, exhibit any very marked indication of the presence of rhubarb, at least not more than in the other parts of the body, though its presence in the urine proved that it had been taken into the system. Sir E. Home has remarked, "that the spleen is met with in two very different states, one of which may be termed the distended, and the other the contracted; and that, in the one, the size is double what it is in the other."

In the distended state, there is a distinct appearance of cells, containing a limpid fluid, distinguishable by the naked eye. In the contracted state, these only become distinct when seen through a magnifying glass; the distended state takes place when the stomach has received unusual quantities of liquids before the animal's death; and the contracted state, when the animal has been kept several days without drink before the spleen is examined. In a subsequent paper, he states his belief that this limpid fluid is the peculiar secretion of the spleen, which is conveyed to the thoracic duct by the lymphatics of the organ, which are, as he has said, larger in this than in any other organ. "The purposes," he adds, "that are served by such a secretion from the spleen into the thoracic duct, cannot be at present ascertained." If I might be allowed to offer an explanation of the preceding facts, it would be the following.

Consistently with the idea, that the spleen is to maintain the balance between the circulating fluid and the ves-

sels destined to contain it, we cannot be surprised to find it in its turgid state, at a time when absorption is making large contributions to the former; and more especially if we admit, as I cannot help doing, that the veins take a share in the process of absorption. The contracted state is not less accordant with that state of the system which must be induced by secretion being continued, while the accustomed supplies are withheld. As to the fluid conveyed from the spleen to the thoracic duct, and which Sir E. Home has considered as the secretion of this organ, I must beg leave to hold a different opinion, and to regard it as merely the effect of ordinary lymphatic absorption actively going forward to relieve the spleen of the load which the other viscera are throwing upon it. The whitish corpuscules, I imagine, are intimately connected with the lymphatic system. I have found them particularly conspicuous in a cat, whose lymphatic glands, throughout the body, were remarkably large.*

If my speculations should prove correct as to the nature of the matter taken up by the absorbents and veins, it may account for the absence of any trace of rhubarb in the fluid contained in the absorbents, and also for the strong signs of it, which Sir E. Home so repeatedly observed in the splenic vein. William Hewson had also observed the fluid contained in the lymphatics of the spleen. The red colour which he observed in it must, I imagine, be attributed to some extravasation, the consequence of congestion, occasioned by the ligature which he had applied.

* Some experiments have been made on this subject by my friend Bracy Clark, a very ingenious and scientific Veterinary Surgeon, who has thrown much light on the feet of animals with undivided hoofs, and has investigated, with great success, the habits of *æstri*, as well those peculiar to other animals as to the horse. I have not yet been able to procure the detail of his experiments; but, from the sketch which I have received, I believe they will rather confirm me, than not. He has not himself advanced any opinion grounded upon them.

In the 8th month (August) last, after dividing the spinal marrow of a cat, I opened her abdomen, and immediately immersed her in cold water, taking care not to admit the water into contact with the viscera of the abdomen. The spleen became sensibly turgid. This seems to prove, as far as the result of one experiment can do so, that the spleen is, in the mode which I have hinted at, subservient, not merely to the vessels of the abdomen, but to those of the system generally. The derangement produced in this viscus, by intermittent fever, tends to the same conclusion.

I have not been able to learn whether any peculiar symptoms were discoverable in the two instances which are recorded, of the spleen having been extirpated in the human subject; but some of those which have been observed in dogs, from whom this organ has been removed, and which Haller has recorded, on the authority of Jolyffe, Boyle, Malpighi, Hunter, and some others, seem to indicate an increased stress upon the arterial extremities; as, *e. g.* an increase in the flow of urine—a greater degree of salacity—and the accession of plethora. In some the functions of the liver were disturbed, and this organ itself rendered turgid.

I have now given a sketch of the principal reasons which have led me to the opinion which I have here advanced, not by any means as a point which I as yet regard as demonstrated, but rather to be considered as a suggestion; nor shall I be surprised if some one, better acquainted with the subject than myself, should say with Haller, "Nondum tamen inde audeas aliquid firmioris theoriæ superstruere;" yet I am induced to trust, that there is enough of plausibility to secure me from censure, in having ventured to bring it forward.

It will, I have no doubt, be thought by most, that I should myself have made more experiments with regard to this question; to whom I can only state, in defence, that,

besides having little opportunity for doing so, I conceived that, by availing myself of the experiments of others, of men of the highest celebrity, no imputation could arise of facts having been warped to suit theory, which, by the theorist, may sometimes be innocently done; and further, the performance of these experiments would be necessarily attended with a degree of cruelty, which would render them alike painful to myself to undertake, and to others to hear detailed.

THOMAS HODGKIN.

Edinburgh, 4th month (April) 1821.

NOTES.

PART I.

CHAPTER I.

Page 11.—In confirmation of the opinion advanced by Dr. Edwards, that venous blood, though greatly inferior to arterial, still contributes to produce the action of the nervous and muscular systems, may be adduced the extraordinary facts with which the epidemic cholera has familiarized us. We have seen individuals, whose dark and blue colour has attested the general circulation of venous blood, exercising, though with a certain degree of habitude, the intellectual and locomotive faculties.

Page 13.—Although in Dr. Edwards' experiments on the duration of the life of frogs inclosed in plaster, the animals do not appear in any instance to have survived more than six weeks; we are not on this account bound to discredit the statement of Hérissant, who kept them alive eighteen months, in boxes inclosed in plaster. My friend — Hodgson of Birmingham, has informed me, they have been kept alive for three years inclosed in globular masses of plaster, but that to effect this, it will be necessary to keep them in a cellar at a low temperature. I believe it is his intention to publish these, and some other interesting facts pointed out by a deceased friend of his.

Page 37.—The fact, that fishes cannot live in water deprived of air, and yet speedily die when removed from the water and exposed to the direct and unmixed influence of the atmosphere, is probably in some respects analagous to what occurs in the mammalia, who, though they cannot survive many minutes, when removed from the vivifying influence of the oxygen, nevertheless require that it

be diluted with a large proportion of nitrogen, or hydrogen, and are soon cut off when restricted to an atmosphere of pure oxygen. I shall have occasion to advert to the experiments of Broughton on this subject in a subsequent note.

The following is a note by Dr. Marshall Hall.

* The results of the experiments detailed in this interesting chapter, do not appear to be all phænomena of the same kind.

It is plain that death is the result of asphyxia within certain limits of temperature. But as we approach that of 42° cent. (107° 6′ Fahr.) the animal is doubtless destroyed, not by asphyxia, but by the positive action of this elevated temperature upon the nervous and muscular systems; the nerves are deprived of their peculiar properties and the muscles become perfectly rigid.

The facts, however, together with those of chap. 2. sect. 1. p. 18, and that quoted from Legallois, p. 148, demonstrate, that exposure to a low temperature, both previous and immediate, enables the animal tribes to bear the privation of air better than exposure to a higher one.

What is the rationale of this fact? Mr. Edwards does not offer a conjecture upon the point. It is probable, that it depends upon augmented irritability. The effect of exposure to cold, when the temperature of the animal falls, appears to be, in a general point of view and within certain limits, diminished respiration and augmented irritability.

The experiments detailed, pp. 19 and the following, appear incomplete. It was found, that the temperature of 42° cent. (107° 6′ Fahr.) was alike immediately fatal to the bactrachiæ in summer and in winter; but as the experiments were first performed in the months of July and September, it was a question not only whether the temperature of 42° cent. (107° 6′ Fahr.) would be equally promptly fatal in November, but whether a lower temperature would not have been so.

It is probable, that all temperatures which reduce that of an animal, without destroying life, raise its irritability and lower its respiration, and render it, at once, less capable of bearing any increased stimulus, as that of heat, and more capable of bearing diminished stimulus, as the privation of air, or of food. This will probably be found a general law of the animal economy, equally applicable to the warm-blooded and cold-blooded animals. It is illustrated and confirmed by the fact quoted from Legallois, p. 148; and by the histories of persons or animals buried in the snow.*

PART II.

CHAPTER I.

Page 55.—I visited the Magdalen grotto, near Adelsberg, in 1824, and obtained some of the protei from the subterranean pools which exist in it. Only

a part of the floor of the cavern was then occupied with water, and these animals might have enjoyed atmospheric respiration had they inclined to do so, to at least an equal degree with those which Dr. Edwards kept in an earthen vessel exposed to the air. They were, however, deprived of the benefit of light.

CHAPTER II.

Page 56. — I have been furnished with the following authorities for fishes being able to live in water at very high temperature, by my excellent and accomplished friend A. R. Dusgate of Paris, from which it would appear, that in a state of nature, fish not only live, but thrive in a temperature beyond the limit which they were able to endure in Dr. Edwards' experiments: may not this difference be in part referred to the influence of habit? Saussure, speaking of the hot springs of Aise in Savoy, says, "I have frequently examined the temperature of these waters at different seasons, and have always found it very nearly alike, viz. from 35 in that of Souffre, and from $36\frac{1}{2}$ to $36\frac{7}{10}$ in that of St. Paul. Notwithstanding the heat of these waters, living animals are found in the basins which receive them. I saw in them eels, rotifera and infusoria, in 1790. I discovered in them two new species of tremelles possessing spontaneous motion, of which a description may be seen in the 'Journal de Physique' for 1790, p. 401." See Saussure, Voyage dans les Alps, vol. vii. pp. 18 and 1168. Neufchatel edition in 8vo.

Sonnerat states, that in the island of Lugon, one of the Manillas, there is a hot spring, of which the temperature was so high as to raise Reaumur's thermometer to the degree of 60, equal to 86·25 cent. or 187·25 of Fahr. According to his account, one could not put one's hand in it, yet he distinctly saw fish which did not appear to be at all incommoded by the heat; and small plants, the *agnus castus*, flourishing in it.—Journal de Physique de Rosier, April 1774, p. 256. See also Rees's Cyclopædia and Pinkerton's Geography.

The *sparus Desfontaines* of Lacepede — the *chromis* of Cuvier, was found by Desfontaines in the hot waters of Cafsa in Barbary, in which Reaumur's thermometer rose to 30 degrees.—See the article 'Sparus' by Bosc, Dictionaire d'Histoire Naturelle, Deterville's edition, vol. xxxi. p. 550. My friend likewise received the same statement from the Professor's own mouth.

The following extract is from Bruce. "At Feriana, the ancient *Thala*, are baths of warm water without the town:—in these there were a number of fish, about four inches in length, not unlike gudgeons. Upon trying the heat by the thermometer, I remember to have been much surprised, that they could have existed, or even not been boiled, by continuing so long in the heat of this medium.

In opposition to the account of the hot springs at Manilla, given by Sonnerat, must be placed that of Dr. Abel, who accompanied Lord Amherst in his embassy to China. In his narrative of the journey, he notices visiting those springs, and remarks, that "Sonnerat has stated, and his statement has been copied by other authors, that a species of fish lives in these springs. It is scarcely necessary to

observe, that I was unable to verify this observation. All the animals which I saw there, and I saw two, a small snake and a frog, were not only dead, but boiled;" but he adds, "a plant vegetates in them, and in this respect my experience partially accords with his. I found a small plant, apparently a species of arenaria, vegetating in a soil that raised the thermometer, plunged amongst its roots, to 110 degrees on the side of the spring, which was 120 degrees."—Fourth edit. London, 1818, pp. 246–249. (It will scarcely escape the attention of the reader, that Dr. Abel's account does not positively disprove that of Sonnerat. Though he appears only to have seen two dead animals, which probably came there accidentally, it is still not impossible, that other species, under the influence of habit, may support the temperature of some parts of the fountain.)

Shaw, after enumerating the thermal waters of Barbary, adds, "The *ain el houte* (fish fountain) and the springs of Cafsa and Tozer, nourish a number of small fishes of the mullet and perch kind."—Shaw's Travels in Barbary, folio edition, Oxford, 1738, p. 231.

The late lamented Baron Cuvier, whilst engaged in publishing his great work on fishes, was reminded of these observations by my friend, and in consequence wrote to M. Marcéscheau, the French vice-consul at Tunis, who, not only confirmed the fact in his reply, but sent him two long-tailed fresh-water turtles, from a basin of water at Utica, of which the water is at the temperature of 36 degrees of Reaumur, or 113 of Fahr. The vice-consul also sent some fishes from the hot waters of Cafsa and Tozer, which proved to be *chromis* or *sparl Desfontaines* of Lacepede. These waters were said to be as warm as 62 degrees of Reaumur.

Breislak in his Institutions Géologiques, has an article on this subject. Amongst other facts, to those above noticed, he adds, that Dunbar and Hunter, in their journey made in 1804, along the Washila or Ouachita, a river of Louisiana, observed above Fort Meiro, on the frontiers of the United States, springs of the temperature of 40 degrees to 50 degrees of Reaumur, or 122 to 145 Fahr., in which were not only growing *confervæ* and herbaceous plants, but also shrubs and trees. They likewise found in them *bivalve molusca*.

Lamark, in his Histoire des Animaux sans Vertebres, states, that the *paladina muriatica* is found in Italy and in France, especially in the south, inhabiting in fresh water, and has been met with in water of the temperature of 34 degrees Reaumur, 109 Fahr.

To these instances presented by nature, of animal and vegetable life, maintained at high temperatures, my friend Dusgate adds the following extract from an article by Bosc, in the Dictionnaire d'Histoire Naturelle, tom. xxxi. p. 551. "The facts mentioned by Sonnerat, and other travellers, induced Broussonnet to make some experiments on the degree of heat which our river fish are capable of enduring. I have no detail of the result of his observations, although I took a part in them; but many species lived for several days in water, which was so hot that I could not bear my hand in it for a single minute."

I have not brought forward these curious facts, with the intention of disputing the general accuracy of the limits of high temperature assigned by Dr. Edwards, as consistent with the life of fishes. As exceptions to it, they may be apparent rather than real, since it is by no means impossible, that the heat of that part of the water in which the fishes were seen, might not be exactly the same as that in which the thermometer was placed. If they cannot in this manner be explained away, they afford a very legitimate object for further enquiry. The following fact is quite compatible with the limit given by Dr. Edwards, but it is interesting as shewing, that a very considerable degree of warmth is not only supported, but very congenial to some species of fish. It is well known, that in manufacturing districts, where there is an inadequate supply of cold water for the condensation of the steam employed in the engines, recourse is had to what are called engine dams or ponds, into which the water from the steam-engine is thrown for the purpose of being cooled; in these dams, the average temperature of which is about 80 degrees, it is common to keep gold-fish, the *ciprinus aureus*; and it is a notorious fact, that they multiply in these situations much more rapidly than in ponds of lower temperature exposed to the variations of the climate. Three pair of this species were put into one of these dams, where they increased so rapidly, that at the end of three years, their progeny, which were accidentally poisoned by verdigris mixed with the refuse tallow from the engine, were taken out by wheelbarrows-full. Gold-fish are by no means useless inhabitants of these dams — they consume the refuse grease which would otherwise impede the cooling of the water by accumulating on its surface. It is not improbable, that this unusual supply of aliment may co-operate with increase of temperature in promoting the fecundity of the fishes. My friend, Charles May, of Ampthill, to whom I am indebted for the fact just related, has communicated to me another fact in proof of the high temperature which vegetable life is sometimes capable of enduring. —John Daulby, brother to the curator at the Botanic Garden, at Liverpool, brought from Iceland, a short time since, a species of *Chara*, which he found flowering and producing seed in one of the hot springs of that island, in which he states, that he boiled an egg in four minutes.

PART III.

CHAPTER II.

The remarks of Dr. Edwards, respecting the hybernating mammalia, induced me to query, whether there might not be some species amongst the class of birds possessed of a similar constitution, as respects the influence of temperature. The migrating birds, which quit this country on the approach of cold weather, seemed the most likely to be of this description. The season was far advanced, and swallows had for the most part left the country, when this idea occurred to me. Through the kindness of a friend I obtained two individuals, which enabled me to perform the following experiment: —

With a small and very delicate thermometer, I ascertained the temperature of the swallows to be 106° Fahr., that of the laboratory in which the experiment was performed, being nearly 70°. One of the birds was then placed in a deep glass vessel, immersed in a mixture of ice and salt. Although the bird remained quiet, its respiration soon became greatly accelerated, and its temperature, in somewhat less than an hour, was reduced about 20 degrees. It is not easy satisfactorily to ascertain the temperature of so small animal as a swallow. In this instance the temperature was examined with a small thermometer, carefully placed under the wing, which was kept applied to the side. Although the extraordinary powers of flight possessed by swallows, and other migrating birds, generally enables them to avoid that degree of cold, which their constitutions are not calculated to resist; it is extremely probable, that if they survived detention in this country, after the setting in of cold weather, they would fall into a state of torpor. The brumal retreat of swallows, has long been a subject of speculation and controversy, and numerous anecdotes of their having been found in a state of torpor, are related by those who maintain the opinion that they do not quit the country, but retire to various places of concealment during the winter. Some of these statements may rest on questionable authority, but I am convinced that others are too well attested to admit of rejection. As an example of this kind, I might cite the following incident which occurred to my friend, James Browell of Guy's Hospital. I will relate it in his own words :—

" I will endeavour to give you as clear an account as I can of the circumstances relating to the habits of the swallow, which came under my notice at a period of life not very prone to philosophise on things seen. The impression on my mind is very vivid, though the distance of time is half a century.

" Residing with my parents in Hampshire, so near the sea that the high tides reached the walls of the house, after morning school, I was occupied in the boyish play of throwing up a ball in the back yard, which fell into a butt placed for receiving the rain water from the roof of the house. It was in the winter, though not a wet time, as the cask was only half full. On my getting up to the edge of the water cask, and leaning over into it, sweeping my hand round in search of the ball, my hand touched the bung cloth, a little under the water, and I felt something which induced me to move it, and found it, on examination, to be a bird in a torpid state, perfectly wet and to appearance inanimate. Whether I had heard any thing said on the subject, or what is not very probable at about nine years of age, had read about it, I cannot recollect; but I remember well, leaving the ball and taking my prize to the kitchen fire, which after drying and warming, I had succeeded in restoring to perfect animation my bird; when my mother found me there, and it was time for me to go to school; my entreaties to be allowed to complete my restoration were not attended to, and I received orders to let the bird fly when it could, and it was put opposite an open window, facing the sun, and on my return from school, no trace of my protegée could be found."

Dr. Marshall Hall has obliged me by furnishing me with his remarks respecting the subjects of this PART. *They are included between asterisks.*

CHAPTER I. III. IV. V. and VI.

* This interesting series of experiments, admits of a ready association and explanation, by a reference to the law, that the quantity of respiration is inversely as the degree of irritability, and the facts, that the activity of the animal is directly as the former, and that its tenacity of life under the privation of air, food, and other stimuli, is directly as the latter. The very young animal has a lower respiration, and a higher irritability than the adult. It has less power of evolving heat, and greater power of bearing the privation of air.

The adult animal has a higher respiration, and a lower irritability. It has greater activity, and less tenacity of life, under the privation of air and food.

The animal which maintains a steady given temperature, has a higher respiration, and a lower irritability, in winter than in summer. Animals, which do not maintain their temperature, have a lower respiration, and a higher irritability, in winter and summer. When the cold induces the state of torpor, these phænomena are observed in a still more marked degree, and the animal bears asphyxia, and the privation of food, with comparative impunity. The fact quoted from Legallois, p. 148, and the case of animals buried under the snow, already noticed, are sufficient proofs of this fact.

CHAPTER II.

It appears to me that the case of the young animal, is incorrectly compared with that of the hibernating animal. The former lose their heat whenever they are exposed singly to the influence of the atmosphere, even in moderate temperatures. The hibernating animal, on the contrary, maintains its temperature unimpaired, even when the thermometer is pretty low.

Besides this remarkable difference, there is another which has not, I believe, been pointed out. It is that *sleep* invariably intervenes, in the hibernating animal, between its power of maintaining its temperature, and the order of phænomena, of which the loss of temperature constitutes one, and one so remarkable.

I cannot, therefore, agree with the inferences of this Chapter, and of p. 155. Under ordinary circumstances, the hibernating animal maintains its own temperature. It has, therefore, the full power of evolving heat. The loss of this power is an induced condition, not hitherto noticed, and is observed in the ordinary sleep of these, and, indeed, of all animals, only in a less degree, than in true lethargy, or hibernation.

It is further obvious, that a due distinction is not made between hibernation, and the torpor which may be induced by cold in any animal, and especially the

young. Legallois commits this oversight. (See p. 148, and the Œuvres de Lagallois, tom. i. 282.) The first condition is preservative, the second destructive of life.*

To the objections of Dr. Marshall Hall, already given in his own words, may be added those of Dr. Holland, respecting the temperature of young animals. The Doctors agree in this respect—that they regard the inferior power of resisting the influence of exposure to cold, which hibernating mammalia, and very young individuals of the class of birds, and mammalia, generally possess, as not indicative of a constant inferiority in the power of producing warmth; since under different circumstances, and a higher temperature, their animal heat exceeds that of the ordinary temperature of the atmosphere, as much, or more than is known to be the case, with those adult mammalia which possess the strongest power of resisting cold. Dr. Holland found the mean temperature of forty infants, aged from one day to eighteen months, to exceed that of the same number of adults, by 1 $\frac{3}{4}$°. Twelve children possessed a temperature of 100° to 103$\frac{1}{4}$°, whilst in no instance did the temperature of adults exceed, and in one instance only did it reach 100°. The solitary observation made by myself on swallows, shows the high temperature which they are capable of raising themselves, in conjunction with a very feeble power of maintaining it. I do not consider that the objections of either of the physiologists, whom I have mentioned, undervalue the credit or importance of Dr. Edwards's observations on the relations which young and hibernating animals bear to external temperature. Without disturbing the practical inferences to be drawn from what has been stated by Dr. Edwards, they are of great value in themselves, not only by correcting one of his deductions, but as leading us some steps in advance into the inquiry concerning the physical and vital conditions, concerned in regulating the phænomena in question. Dr. Hall considers that a different degree of irritability, possessed by young animals, by hibernating mammalia, and in some degree even by other adult mammalia, which have been exposed to the continued heat of the summer season, is the constant associate of their inferior power of resisting external cold.†

I confess that I am much disposed to adopt this view, which, so far from arresting the progress of inquiry by interposing the mysterious agency of the nervous system as an insuperable obstacle, ought rather to assist our investigation concerning the functions of that system. Dr. Holland, in his experimental inquiries into the laws of life, takes a different view of the subject. He, as well as Dr. Hall, has ably pointed out the fallacy of some of the conclusions of Dr. Wilson Phillip, and others, with reference to the agency of the nervous system; but I cannot help suspecting, that he has carried his objections somewhat too far, and thereby been led to regard the functions he has examined, as more independent of

† See two papers in the Philosophical Transactions on Hybernation and on the Inverse Ratio which subsists between Irritability and Respiration, by Dr. Marshall Hall, 1832.

the nervous system than is really the case. Be this as it may, the view which he has taken has had one important influence on his investigations. It has led him to pay a very careful and undivided attention to the varied conditions of the circulation and respiration, functions, which certainly stand in the closest relation to the production of animal heat.

Dr. Holland lays it down as an axiom, on which he strongly insists, and which he makes the basis of several other principles, which it is his object to establish, that animal heat is in the inverse ratio to the quantity of blood exposed to oxygen in the lungs; and he opposes the opinion of Dr. Edwards, that it is in the direct ratio to the quantity of oxygen consumed. Dr. Holland insists on the opposite effect produced by inspiration and expiration. The latter tends to expel blood from the thorax, and to oppose its return thither, consequently, when the force of the expirations predominates over that of the inspirations, the quantity of blood in the lungs is diminished, and the production of animal heat is increased with the diminished proportion which the blood bears to the inspired air. He illustrates this by various kinds of exercise, by the effects of the exhilarating passions, and of some diseases. He is obliged, however, to admit the acceleration of the circulation, by which the mass of blood is brought more rapidly and frequently under the influence of inspiration, to be one of the causes of the increase of temperature.

A predominance of inspirations, he represents as producing precisely the opposite effect. It increases the quantity of blood in the lungs, and, consequently, its proportion to the inspired air. Hence it is followed by a manifest reduction of temperature. The depressing passions, bodily inactivity, and various diseases productive of congestion of blood in the lungs, but more especially asthma, are adduced as illustrations of this point of the Doctor's views. He attributes the diminution of the production of heat, occasioned by a sudden, or temporary exposure to cold, to be owing to the altered condition of the circulation — the surface of the body becomes pale, because the capillaries cease to be filled with blood — the internal organs are loaded at their expence, and the blood in the lungs bears a larger proportion to the inspired air. Though he differs from Dr. Edwards in regarding their young animals as capable, under favourable circumstances, of raising their temperature to as high, or even a higher degree than that of adults, he of course admits their inferior power of maintaining it, in spite of exposure to cold, and attributes this to the difference in the character of the circulation at different periods of life; that of the young animal, is what he calls external, the blood sent to the surface bearing a larger proportion to that with which the internal parts are supplied, than is the case with the adult, whose circulation possesses, what the Doctor calls the internal character; this change he attributes to the successive development of particular organs. In the young animal, at birth, the internal organs present their minimum of activity, digestion calls an encreased quantity of blood to the chylo-poietic viscera — the lungs continue to receive an increasing quantity of blood as the thoracic viscera are developed under the influence of respiration and exercise. The exercise of the functions of the brain

makes a demand in that direction, and the last additional demand is made as the period of puberty takes place by the development of the sexual organs. The habits and passions of the young animal concur with its organization to give the external character to its circulation, whilst those of the adult concur with the organic changes which it has undergone, in producing the preponderance of the internal circulation. It is to these differences, which I have briefly sketched, that Dr. Holland refers the inferior power which the young, compared with the adult animal, possesses, of resisting cold. When cold has constringed the vessels of the surface, a larger quantity of blood is thrown upon the internal organs, which receive it, with a less proportionate capacity of vessels, than in the adult. The proportion which the blood in the lungs bears to the inspired air is increased, and the production of heat, according to the Doctor's hypothesis, is diminished as a consequence. Adult animals in summer have a circulation of a more external and juvenile character than in winter; hence their power of producing heat is liable to a similar reduction by the application of cold. Dr. Holland brings forward several interesting facts, and employs considerable ingenuity of reasoning to support of his views, and to exhibit the importance of their application; they do not, however, appear to contain the whole truth. Why does the vigorous adult maintain the ruddy colour of his well-injected skin in a temperature, in which the infant would be pale and benumbed with cold? Dr. Holland himself remarks, that the greater vigour of the adult enables him to resist cold better than the infant. The reader is left to form his own opinion of what this vigour consists, and I confess, that I think this is to be found in the different condition of the nervous system, which Dr. Holland appears not to take into account in his investigation of the calorific process.

I must return to his objection to Dr. Edwards's view regarding the production of heat, when we shall have to consider the changes of the air effected by respiration.

[*The following experiments, which the kindness of Sir Astley Cooper has allowed me to extract from amongst several recorded in one of his Memorandum Books, dated* 1790, *anticipate and corroborate some of the observations of Dr. Edwards. — They have not to my knowledge been hitherto published.*]

Experiment I. — A young puppy was immersed in warm water, at about 120° Fahr. for one minute and a half. It struggled violently, and during the latter part of this time threw out the air from its lungs. It then remained still for another minute and a half, when its struggles were renewed, at which time it voided its excrement. These efforts were soon over. After remaining still for three minutes, it was put into another vessel containing water of the same temperature. In this it gasped twice or thrice. In ten minutes after its first immersion I opened it — a slight undulation was observable at the lower part of the

right auricle of the heart, and there was some motion in the intestinal canal. The action of both ceased in about a minute, and could not be reproduced by the irritation of touching and piercing it. Thus, then, the action of the heart was destroyed eleven minutes after its first immersion.

Experiment II. — A puppy, of the same age as the last, was immersed in water, at about 56° Fahr. For one minute and a half its voluntary motions continued violent — it expired the air from the lungs, and then was quiet. At the end of another minute and a half its struggles were renewed. Its excretions passed off. For two or three minutes after it continued to gasp. It was then thrown into another vessel containing water of the same heat. It gasped at the end of every minute, and ten minutes after its first immersion it was opened. The heart acted vigorously, and there was strong peristaltic motion in the intestines. The action of the heart continued strong for nineteen minutes after it was opened, when it began to undulate — it undulated for four minutes, when all action ceased. At the end of twenty-nine minutes, then, the heart of this animal acted as strongly as that of the first, which died in ten minutes.

Experiment III. — A puppy was immersed in water heated to 90° of Fahr. for a minute and a half. It continued to struggle violently another minute and a half — it remained motionless — when it began to struggle again, and for half a minute continued to do so. At the end of ten minutes it was opened. The lower part of the right auricle undulated, and continued to do so seventeen minutes after it was opened, when no motion could be produced by the stimulus of vinegar, or by the irritation of pricking it.

Experiment IV. — A puppy of the same age was immersed in cold water. The first minute and a half it struggled. It remained quiet for one minute and a half, then struggled again. It continued to struggle at the fourth and fifth minute for one quarter of a minute. At the tenth minute it was opened. The heart contracted strongly in every part, and the intestines moved. Eighteen minutes after opening the animal, the heart contracted more strongly than that of the third experiment did at first, and it continued to undulate six minutes after; so that it acted twenty-four minutes from the opening of the chest.

Experiment V. — A kitten was put into cold water, and after about two minutes ceased to struggle. For some minutes after it had convulsive motions. Twelve minutes after it was immersed, its abdomen and thorax were opened. The heart was contracting, and the intestines moving. The heart continued to do so for half-an-hour.

Experiment VI. — A kitten was immersed in water heated to 100° Fahr. Its efforts seemed rather more violent than those of the other in the fifth experiment. Its convulsions were sooner discontinued. Twelve minutes after its immersion it was opened — no action could be observed, either in the heart or intestines, nor could it be produced by stimuli or irritation.

Experiment VII. — A snake was opened after having been immersed in rectified spirits of wine in order to destroy it. It coiled itself up, became rigid, and

was supposed to be dead. In opening it, it shewed some voluntary power, and its heart was found beating strongly. It was put into a vessel of cold water, and the action of the heart became languid and slow. It was then thrown into water heated to about 80° Fahr. — the action of the heart became quick and vigorous, and it began to move freely in the vessel, recovering its voluntary motions, although its body was opened. It was then returned into cold water — its voluntary power lessened, and its heart acted less frequently and vigorously.

Experiment VIII. — The atmosphere being at 61½° Fahr., a thermometer was introduced into the belly of a viper, and it stood at 76°.

Experiment IX. — Water was heated to 99½° Fahr. A viper was plunged in and kept there ten minutes. The thermometer stood in its belly at 92°, but soon fell.

Experiment X. — A viper was exposed to air heated to 102° Fahr., and kept there fifteen minutes. The thermometer stood in its belly at 96°.

Experiment XI. — A viper was exposed to air at 34° Fahr. It became torpid in a considerable degree — it was retained in this stupefaction fifteen minutes. The thermometer stood in its belly at 42°. Nitre and muriate of ammonia, in equal parts, were used to produce this degree of cold. From these last experiments it appears, that the viper is subject to great changes of its temperature by the surrounding atmosphere, which corroborates the idea of Dr. Crawford, — "for these reptiles have their blood but very partially heated; hence their power of resisting high and low degrees of heat must be weak."

Experiment XII. — I put a kitten six weeks old into water, which I kept at 32½° Fahr. by putting in it small pieces of ice. Its mouth was above water. It died at the end of sixteen minutes. During almost the whole of the first five minutes it laid quiet in the water, but its nose, lips, and gums, which were previously pallid, soon after immersion, became of a beautiful vermillion colour. It struggled violently during the second five minutes. Between the tenth and sixteenth minutes it laid quietly. It breathed first quickly, then laboriously, and lastly at long intervals, when it died. Upon introducing a thermometer, immediately after the last breath, into the chest, it stood at 52°. The heart did not act. The blood was of a florid red in the left side of the heart. The peristaltic motion of the bowels still continued. When touched, the heart acted; but was quite motionles, unless thus stimulated. An hour and thirty-five minutes after its apparent death, I poured warm water at 90° or 100° into the chest. The heart began to act, and continued to do so for more than two hours; therefore, four hours after the chest had been laid open. The blood in the mesentery was very florid.

Another experiment, almost in every respect similar, is related as tried upon a puppy a month old. It survived twice as long. Its temperature was less reduced, and its heart continued to act longer. Its lips, nose, and toes, became of a florid colour.

A few experiments on the immersion of kittens seven days old in water of different temperature. Made 28th August, 1832. By T. Nunnelly.

With water pumped up from the well at 57° Fahr.

No. 1. Struggled hard for a minute, when it apparently became insensible and passed the fæces; it exspired frequently and made violent attempts to inspire. Some involuntary motion was continued for two minutes and a half, when it was taken out, wiped dry, and placed before the fire at a temperature of about 80; it heated immediately and quickly recovered.

No. 2. Allowed to remain in the water four minutes; the effects were the same as in No. 1, except that it did not completely recover so soon.

No. 3. Allowed to remain under the water for five minutes; during the last minute the involuntary motion was very slight, when taken out, breathed, and recovered in fifteen minutes.

No. 4. Allowed to remain under water for six minutes; this kitten did not breathe for thirty seconds after being taken out, and was half an hour before completely recovering.

No. 5. Allowed to remain under water for ten minutes; for seven minutes and a half some very feeble involuntary motion could be seen, but not more than three minutes after the fifth minute. When taken out it was apparently quite dead. I opened the trachæa, and continued artificial respiration for ten minutes before it made any effort to respire, which for half an hour was very feeble; for an hour it lay in a comatose state, after which it gradually recovered, and in four hours looked much as the other kittens. I allowed it to live for two days, when I destroyed it, as of course it was unable to suck owing to the opening in the trachæa.

With water at 100° Fahr.

No. 1, 2, 3. Effects much the same as with water at a temperature of 57°F.

No. 4. Remained under water six minutes; this kitten recovered, but was a longer time than that with the water at 57°, and lay for an hour as though asleep without moving, unless disturbed.

No. 5. Allowed to remain under water for ten minutes; motion was perceived for a longer time than in the similar experiment with water at 57°, viz. for nine minutes. When taken out it was quite dead. Dry heat was applied, the trachæa opened, and artificial respiration continued for an hour without success.

Water at 120° Fahr.

No. 1. Allowed to remain under the water for five minutes; it struggled hard as the others did for a minute, and involuntary motion could be seen for four minutes. When taken out, it was quite dead, and although precisely the same means were adopted as with the other cases, they were without success.

In all the kittens that recovered, in proportion to the time they had been under water, was the breathing at the first slow, it then became exceedingly quick and short, and it was some time before they regained their ordinary temperatures, quite as long, or rather longer, after the warm medium, as after the colder.

THOMAS NUNNELLY.

PART IV.

CHAPTER II.

Since the publication of Dr. Edwards's observations respecting the heat of young animals, some interesting researches have been made by his brother, Dr. Milne Edwards, in conjunction with Dr. Villerme. They not only prove the inferiority of the infant's power of resisting cold, but show in a forcible and striking manner, the great practical importance of bearing this fact in mind. It is the custom in France to convey infants, within a few hours of their birth, to the office of the mayor of the quarter in which the nativity took place, in order that the birth may be registered, and the child become posssessed of its civil rights. A careful comparison of the register of births, with the register of deaths, furnished statistical observations on so large a scale, that there can be no room to doubt the correctness of the results. It appeared that the proportion of deaths, within a very limited period after birth, compared with the total births, was much greater in winter than in summer, and that this difference of proportion, was much greater in the northern and colder departments, than in the southern and warmer. The details of this investigation are recorded in a paper which the Doctors have presented to the Institute. They have since continued the inquiry, and the following extract from a letter which I have received from Dr. Milne Edwards, will show the accordance of their results.

"In order to ascertain in a more positive manner than before, whether the mortality of new born children is increased by their being carried to the *maire* immediately after birth, we obtained from the minister of the interior, necessary orders to have the tables of mortality of infants made in a certain number of parishes, where the inhabitants are scattered over a larger surface of ground; and in others, where they are, on the contrary, agglomerated around the *maire*. It appeared evident to us, that if our opinion was correct, the increase of mortality during winters, must be much greater in the former parishes than in the latter, and such is, indeed, the result actually afforded by our tables."

CHAPTER IX.

I have received the following letter on the subject of cutaneous absorption, of which Dr. Edwards is a decided advocate, and, although, it combats the Doctor's opinions, I am induced to publish it, not only because the author, Dr. Corden Thompson of Sheffield, is an extremely well-informed physician, tho-

roughly versed in physiological reasoning and experiment, on which account his opinion is entitled to respect; but also, because it affords me an opportunity of meeting similar objections, which may be urged by others, against the conclusions maintained by Dr. Edwards, upon this subject.

"At the commencement of his observations on cutaneous absorption, Dr. Edwards states, that from comparative essays made in air and water, Seguin thought himself justified in concluding, that the latter fluid was not absorbed. But, he continues, 'the result of these experiments admits of being viewed in a different light, when we consider certain facts relative to the animal creation.' 'We have seen,' he observes, 'that the batrachia are capable of imbibing, by their external surface, a considerable quantity of water, which passes into the system at large. In such animals, as well as in man, the skin is bare, a condition highly favourable to absorption. The human skin, it is true, from the nature of its cuticle, is less fitted for performing this function, though it continues to exercise it in a high degree.' Such is the language of Dr. Edwards. Now, in the first place, I cannot, for a moment, admit the correctness of the analogy, here assumed, betwixt the exterior surface of the batrachia, and that of man. The former approaches the nature of mucous membrane, the absorbing faculties of which, no one for a moment questions; but, the latter, is essentially modified by the dry superjacent cuticle, which, even the Doctor confesses, is less fitted for for absorbing. To infer from mere analogy, that because the one takes up substances, therefore the other does, is in reality to take for granted, the very thing which ought to be proved. The analogy, in fine, is incomplete; the anatomical elements of comparison are not the same in each case; neither are the functions of the structures in question the same. Pursuing, however, a similar, and I should say, illusive mode of argument, we are told that it becomes impossible to entertain further doubts on the subject, when we witness what occurs in animals, the teguments of which, appear the least susceptible of transmitting fluids. Lizards, for example, possess, as all know, a hard scaly exterior, which should seem an effectual barrier to the passage of an aqueous fluid. Yet, could this be proved to take place, our author imagined he would be justified in concluding *à fortiori*, that a similar transmission exists in the human integuments. Hence, for the purpose of determining that point, he confined an animal of this description in water, in such a way, that the tail, posterior, extremities, and corresponding parts of the body, were alone immersed. The lizard, moreover, in order to excite the activity of the absorbents, had been previously kept in air for a few days; its weight being thus somewhat diminished, any subsequent increase would be rendered more notable. At different intervals of time the animal was weighed; and the weight gradually augmented until the loss it had previously sustained was restored. At this stage, the experiment was stopped, the Doctor being satisfied with its result. I cannot, however, help thinking, that he has overlooked several very important considerations; considerations, which, to me, at least, seem altogether to invalidate the conclusions drawn from this trial. In the first place, whe-

ther absorption by the skin do, or do not, exist, that by the lungs cannnot for a moment be doubted; neither can it be doubted, that it is of a most active and energetic description. Now, here we have an animal confined mid-way in water, in a glass tube, and surrounded therefore by a highly moist atmosphere, and yet no notice whatever taken of pulmonary absorption! This omission of itself is fatal to the accuracy of the experiment. But, again; if we revert to the nature of the integuments, such an experiment, we shall see, is not calculated to settle the point in question. The exterior covering of the body is an inorganic production, and like similar substances, capable of mechanical imbibition, after continued maceration in a fluid. This is very easily observed in those parts of the body where the cuticle is thick, as in the hands and feet. When thus saturated, it becomes white and wrinkled. In like manner, the inorganic tegument of the lizard would doubtless absorb a portion of water, after considerable maceration in that fluid, and thus the weight of the animal be increased, totally independent of any absorption, into the interior of the system. Here, then, is another source of fallacy. But, let us even suppose, after continued maceration of the integuments in water, and after having thus been saturated, that eventually a portion of the fluid finds its way into the system, would such an experiment warrant us in concluding, that under any ordinary natural circumstances, any such thing as cutaneous absorption exists? Surely not; and I apprehend we shall find it to be a frequent and radical error with experimentalists, to conduct their experiments under highly unnatural circumstances, and to assign the result, thus obtained, as a natural and ordinary function of the animal economy.

"If we except Seguin, whose admirable experiments on this subject most physiologists are well acquainted with, Dr. Edwards does not notice any other writers, or the facts which they adduce, in disproof of the doctrine which he maintains. Seguin himself, indeed, obtains but a cursory glance; nor are his experiments in any way refuted. Having established the existence of cutaneous absorption, as he conceives, by the evidence already mentioned, Dr. Edwards next proceeds to institute, what may be called, tare and tret computations, relative to the gain or loss sustained by the body when immersed in water. And here again the capital oversight is committted, of neglecting to take *pulmonary absorption* into the estimate. It is needless, therefore, to follow him in his observations on this part of the subject. On the whole, the evidence from which Dr. Edwards seems to infer the existence of cutaneous absorption, is either loose and vague on the one hand, or manifestly fallacious on the other. The doctrine *may be* true; but the reasons here produced, are insufficient to substantiate it."

The principal objection advanced by Dr. Thompson, appears to rest on the experiments of Seguin, and on the impediment, which he conceives, the epidermis must oppose to absorption from the surface of the body. There can, indeed, be no question as to the reality of the obstacle, but it is by no means evident, that it is insurmountable. On the contrary, I think it most reasonable to infer, that if this absorption, or imbibition, can take place through the dense and less per-

vious coverings of many reptiles, it must, notwithstanding Dr. Thompson's objection, be admitted in the case of the human epidermis. There is an obvious difficulty in bringing this question to the test of direct experiment, arising from the fact, that exhalation, or transmission outwards, is unquestionably taking place, and in general to a greater degree than we can even suspect it to take place in the opposite direction. This very objection, however, furnishes us by analogy, with one of the best arguments in favour of cutaneous absorption, since we have the authority of several investigators, and more especially of Fodera and Dutrochet, to prove that imbibition, and transudation, are reciprocal and simultaneous. Dr. Thompson points to pulmonary absorption, as the cause to which the supposed effects of cutaneous absorption ought to be ascribed. Many experiments, but especially those of Meyer and Magendie, leave no room to doubt the activity of the pulmonary absorption; but, except under very extraordinary circumstances, it does not seem probable that it can be exerted to any considerable extent, except upon the secretions of the mucous membrane itself. It cannot, therefore, be assigned as the inlet to any perceptible accession to the system. The fact, that the expired air is much more charged with watery vapour, than that which is inspired, tends to the same conclusion. If Dr. Edwards has omitted, as Dr. Thompson remarks, to notice the statements of several authors, who have called in question the reality of cutaneous absorption, he has likewise omitted to claim the support of many who have sanctioned it, amongst whom might be mentioned several of those who have written on the subject of diabetes.

Connection of rainy seasons with disease, exemplified in the cases passing through an hospital.

There fell at the Havannah, in seven years, 603¾ French inches of rain, viz. in 1821, 131½ inches; in 1822, 53½ inches; in 1823, 100 inches; in 1824, 79½ inches; in 1825, 97 inches; in 1826, 74 inches; in 1827, 68¼ inches.

The distribution per month, was as follows:— average for January, 4½ inches; for February, 3 inches; for March, 3½ inches; for April, 2¼ inches; for May, 9½ inches; for June, 23½ inches; for July, 5½ inches; for August, 6½ inches; for September, 10¾ inches; for October, 10½ inches; for November, 4¾ inches; for December, 1¼ inches.

From a corresponding table of 4028 sick, who passed through the Hospital, in the course of seven years, it appears, that the *months* in which the sick exceeded the monthly mean in number, were those from May to October inclusive, in which, (with two exceptions) the rain was above the general monthly average of seven inches. And the two exceptions lying between months which had rain in excess, and following the highest amount of rain, (in June,) seem to be accounted for on the principle, that disease may be continued by infection, after the atmospherical predisposing causes have ceased to operate. Again, the *years* in which the rain was above the annual mean of 76½ inches, are mostly those in which the sick exceeded the average annual number of 575 cases.

In both accounts the *temperature* is not to be left out of the question. The annual mean, being 25·6° cent.; that of the winter, is 21·8°; of the summer, 28·5°. The number of sick in seven years is, on an average for the winter, 218; for the summer, 357. Yet it is not probable that heat alone, without the moisture, would cause such a difference, but rather, that the summer would in that case be the more healthy season. — Translated and abridged (with a remark annexed by L. Howard) from *Bibliotheque Universelle*, 16me année, p. 33.

Although it can scarcely be supposed, that any slight addition to the weight and pressure of the atmosphere can have any sensible effect on the animal economy, seeing, that not only changes of this description frequently accompany vicissitudes in the weather, without leading to any obvious consequences, and that by ascending to considerable heights and by descending into mines, we may greatly increase the extent of such changes with perfect impunity; yet, I cannot omit to notice a recent observation of Dr. Prout's, which seems to indicate, that even a slight increase in the weight of the atmosphere, may be the concomitant, if not the cause, of a highly deleterious influence. Dr. Prout had, for years, been in the habit of carefully examining the weight of the atmosphere, when, on the breaking out of cholera, he noticed a slight, but sensible increase of its weight, which maintained itself with constancy for six weeks, when circumstances occurred to suspend the Doctor's observations. He does not attribute any morbid influence to the mere increase of weight of the atmosphere, but rather regards this as the consequence of a deleterious and heavy gaseous principle, diffused through the lower regions of the atmosphere. For a detailed account of Dr. Prout's experiments and opinions upon this subject, the reader is referred to his paper, which is about to appear in the transactions of the British Association.

Those who descend to a considerable depth in diving bells, are subjected to the greatest atmospheric pressure to which it is easy for man to expose himself; but its effect is necessarily complicated with that of the deterioration, and want of motion of the air. Notwithstanding these combined sources of inconvenience, it is well known, that workmen may continue their operations, during several hours of the day, at a depth of many feet. From personal experience of the effects of this situation, during about half-an-hour, I may state, that the only painful sensation is that occasioned by the pressure on the membrane of the tympanum, which is felt on first descending; but soon ceases, when the equilibrium between the interior and exterior of the body is restored. The blood is very much driven from the surface of the body, producing in general extreme paleness. When the superficial capillaries are not emptied, which I observed to be the case with one individual, who had, what is styled a fixed colour in his face, they become completely livid. According to the theory of Dr. Holland, the production of heat ought to be reduced nearly to its minimum, since the proportion of the blood in the lungs to that of the inspired oxygen must be great. The heat, however, becomes oppressive. It seems by no means improbable, that increased pressure of the atmosphere may be one of the causes requiring the exercise of the function, which I have ascribed to the spleen.

CHAPTER XVI.

In considering the observations of Dr. Edwards on the changes of the air in respiration, there are two points which appear to be particularly interesting and worthy of attention. The experimenters who have succeeded him had arrived at different conclusions, more especially with respect to the consumption of oxygen, and the alterations in the quantity of nitrogen. As these differences could not be attributed to errors of observation, they tended to render the subject more complex and puzzling, until Dr. Edwards, by instituting a series of experiments, continued through the different seasons of the year, at once confirmed and explained the discrepancies of his predecessors, and made a valuable discovery respecting the influence of climate and season. The other point to which I have alluded, refers to the part of the body in which the changes in the respired air are effected. It had been a subject of question, whether the carbonic acid expired, was not formed immediately in the lungs, by the combination of the oxygen of the atmosphere with the carbon of the venous blood. According to another view, it was supposed that whilst a portion of the oxygen of the atmosphere was taken up by the blood, and carried with it in its circulation, and at the same time carbonic acid was thrown off from the lungs, having been previously taken up in the course of the circulation. Dr. Edwards appears to have settled this question, which seemed previously to be nearly balanced, by confirming the latter view. We have, therefore, in the function of respiration, not only a striking instance of the transudation, and imbibition of the gases through the membrane, but also of their simultaneous passage in different directions. In both of these respects, Dr. Edwards has anticipated Fodera and Dutrochet, whose observations have further elucidated them, and pointed out analogous phænomena in other parts and functions. Since the publication of Dr. Edwards's work, some further experiments on respiration have been performed by those careful and accurate operators, my friend William Allen, and his associate, W. H. Pepys ; and others of equal interest, by my friend S. Broughton. Before I notice the facts, which these experimenters have either confirmed or added, it appears necessary that I should notice the discoveries and views of Dr. Stevens, which throw the most important light on the process of respiration. These views were not the offspring of speculation, which he has sought to confirm by subsequent experiments, but they forced themselves upon him, whilst he was investigating the changes of the blood, and the phænomena of fever ; and it seems necessary that I should remark, to set aside any prejudice which may exist in the mind of the reader, that the Doctor's physiological observations respecting respiration, stand upon their own distinct merits, and are by no means compromised by his pathological and therapeutical doctrines. In order to keep the subjects distinct, I purposely refrain from offering an opinion respecting the last mentioned points ; yet, I cannot withhold the expression of my admiration of the zeal, perseverance, and self-devotion, with which the Doctor has pursued his investigations respecting them, under the most

arduous, and, perhaps, perilous circumstances. One of the most striking facts which the Doctor has brought into notice, is the powerful attraction which exists between oxygen and carbonic acid. It was so fully admitted amongst chemists, that carbon in carbonic acid is united with its maximum dose of oxygen, that the idea of attraction between carbonic acid and oxygen was rejected from *à priori* reasoning by several able chemists, to whom the Doctor mentioned the subject. The fact, however, is clearly proved by the experiments of Dr. Stevens. If a receiver filled with carbonic acid, and closed by a piece of bladder firmly tied over it, be exposed to the atmospheric air, the carbonic acid, notwithstanding its superior specific gravity, rapidly escapes, and does so without the exchange of an equivalent portion of atmospheric air; the bladder is consequently forcibly depressed into the receiver. If the converse of this experiment be tried, and the receiver, containing atmospheric air be tied over with a piece of bladder, or thin leather, and then be immersed in carbonic acid, this gas will so abundantly penetrate the membrane, and enter the receiver, as to endanger its bursting.

Dr. Stevens had repeated opportunities of verifying these facts, during a stay which he made at Saratoga, in the United States; the springs at which place liberate a large quantity of carbonic acid. In the high rocks it often collects in considerable quantity and purity, and experiments on dogs and rabbits are often made for the entertainment of strangers, as at the Grotto del Cane, near Naples. This rock stands by itself in a low valley, through which there run two currents of water, the one fresh and superficial, the other beneath, and charged with salts and carbonic acid. A current of this water rises to some height in a cavity of the high rock, which appears to have been formed by a deposition of earthy salts from the water. It has a conical figure, the base of which, is below the surface of the ground, is about nine feet in diameter. It rises about five feet from the ground, where it is truncated, and presents an aperture a foot in diameter. The cavity of this rock is conical, like its external figure—the water appears formerly to have overflowed the summit, but it now rises in general only about two feet above the ground. In the three feet above, the liberated carbonic acid collects, but it varies very much, both in quantity and purity, notwithstanding the sides of the rock are thick and impervious, and the superior specific gravity of the gas, which is constantly liberated in large quantity. The removal of the carbonic acid appears to be effected by virtue of that attraction, which Dr. Stevens has pointed out as existing between it, and the oxygen of the atmosphere. When the air is somewhat agitated by wind, a taper will burn in the cavity of the rock, almost as low as the surface of the water; but when the air is calm, the taper is extinguished much nearer the top of the rock. By luting a large funnel over the aperture, so as to exclude the influence of the air, the rock became filled with carbonic acid, which the Doctor collected for his experiments, at the mouth of the funnel. Dr. Stevens took advantage of the facilities afforded by this rock, to multiply and vary his experiments, the results of which, were not only perfectly satisfactory to himself, but to many individuals to whom he exhibited them. This attraction, which the

Doctor has pointed out, is not only to be regarded as an important agent in the function of respiration, but throws considerable light on the constitution of the atmosphere, since it accounts for carbonic acid, notwithstanding its greater specific gravity being found in equal proportions at every elevation to which we can ascend, instead of being collected at or near the surface of the earth.

Experiments similar to those of Dr. Stevens, and attended with the same results, have been published in an American Journal, by Drs. Faust and Mitchell, who have anticipated Dr. Stevens, in committing them to the press, without making any allusion to his discovery, although there can be but little doubt but they were in a degree acquainted with it, as the Doctor himself had related the result of his previous experiments, not only to other professional individuals in the United States, but even to the very editor of the Journal in which the American papers were first published. It is stated also, that this gentleman took a part in Dr. Mitchell's experiments. Dr. Stevens formed his views, respecting the attraction of the atmosphere for carbonic acid, and committed them to paper, in 1827, at which time, he resided in the West Indies. In 1828, they were mentioned, or shewn in manuscript, to several persons in this country: and in France, which the Doctor visited in 1839, more than one chemical philosopher was disposed to dispute the existence of such an attraction — Dr. Edwards himself was amongst this number.

Dr. Stevens went to the United States in 1830, in the seventh month (July). The American experiments commenced soon after, and were published before the end of the year. The reader, I trust, will allow the excellence of the principle, *suum cuique*, to be a sufficient apology for the introduction of this statement.

Although this mutual influence, between carbonic acid and oxygen, may not now be doubted, yet different views may be entertained respecting its nature. The views and discoveries of Dalton, respecting the admixture of gases and vapours, appear to bear the closest relation to this subject, but they do not seem to be adequate for the explanation of all the phænomena. Although the particles of a particular gas, or vapour, may repel each other, yet allow those of a different gas, or vapour, to come between them, and thus allow, what Dr. Mitchell styles, the penetrativeness of one and the elasticity of another gas, to promote their intermixture; yet, it is not very evident, that this theory can explain their energetic union, when a membranous septum has been interposed between them, and still less, why carbonic acid should be so much more powerfully brought into admixture with oxygen, than with nitrogen, or hydrogen, which are much rarer gases.

It has been supposed, that the phænomena pointed out by Dr. Stevens, are of the same nature with those which Dutrochet has described under the terms, endosmosis and exosmosis, but unless we are to regard every instance, in which one fluid diffuses itself through another, or passes through a porous body, as an instance of endosmosis, or exosmosis, an idea which Dutrochet himself would re-

ject — there is, notwithstanding, some analogy — a striking difference between the phænomena in the cases of endosmosis related by Dutrochet; the intervening septum performs a very important part in influencing the movement of the fluids. This is most strikingly exemplified in the application which he makes of his principle to the circulation of the sap in the roots and branches of plants. In the phænomena pointed out by Dr. Stevens, the impulse resides in the gases themselves, and all we can say respecting the septum interposed between, is, that it does not prevent their union.

Although Dr. Stevens informs us, that Dr. Edwards offered some objections to his views, respecting the removal of carbonic acid from venous blood in the lungs, by virtue of an attraction for that acid, inherent in the inspired air; yet, I must confess, that after a careful consideration of the subject, the views of Dr. Stevens, instead of militating against the observations of Dr. Edwards, are in the most satisfactory accordance with them.

In order to understand the application of the attraction pointed out by Dr. Stevens to the function of respiration, it will be necessary to be aware of a few facts relating to the blood; some of these were more or less known prior to the experiments of Dr. Stevens, but he has the merit of greatly extending, as well as applying them. All acids impart a dark colour to the blood. With respect to most acids this colour remains, although the added acid be afterwards saturated. Carbonic acid forms an exception, for on the removal of this aerial acid the blood resumes its bright and arterial colour. Alkalies, like acids, darken the colour of the blood, but salts produce a bright and vermillion colour, when added to the colouring matter of the blood. The alkaline carbonates require particular notice. The acid is so feebly held by the base, that in some respects they conduct themselves as alkalies, and in particular, will restore the blue colour to reddened litmus. Dr. Stevens believes that this circumstance has led some chemists of great celebrity, to admit the presence of free alkali in the blood, whilst he takes an opposite view, and believes that in venous blood at least, there is a superabundance of free carbonic acid, which, however, is soon removed by exposure to the air. This opinion seems to be confirmed by the fact, that if water, holding carbonate of soda, and carbonic acid in solution be added to the blood, a deep and venous hue is produced. After a short exposure to the air the carbonic acid is removed, as Dr. Stevens believes, by the attraction already noticed, and the blood is reddened by the carbonate of soda, the influence of which, is no longer controuled by the redundant acid. The recently separated serum of venous blood has no effect on turmeric paper, although it has after a little exposure to the air.

There are many other phænomena connected with the blood which Dr. Stevens has noticed; for these, I must refer the reader to the Doctor's own interesting work. Those which I have already mentioned, will suffice to enable us to appreciate the light which the Doctor has thrown on the function of respiration. I must, however, take the liberty of remarking, with respect to the curious phænomena he observed with the help of a powerful solar microscope, that I believe some fallacy

attends them, in consequence of the heat unavoidably applied to the object, brought into the field of the instrument in bright daylight. It will, I am sure, be understood, that I am not invalidating the Doctor's evidence, when I ascribe many of the globular appearances which came under his view, to the disengagement of gases effected by the heat in question. The best compound achromatic microscopes, not only possess a superior power, but are exempt from the objections which I am now urging against the solar microscope. The account given in this volume of the microscopic appearances of the blood, as seen through a compound microscope of the highest quality, does not coincide with the description given by Dr. Stevens. The explanation which I have offered, will, I believe, satisfactorily account for the difference. Though I do not regard the microscopic phænomena, described by Dr. Stevens, as affording a correct view of the structure of the blood, I am not disposed to reject them, but rather to query, whether they may not lead to some curious observations in the disengagement of gases from fluids.

To return to the subject of respiration. The views of Dr. Stevens accord with the opinions of those who reject the idea of the formation of carbonic acid as taking place in the lungs, by the immediate union of the oxygen of the atmosphere with the carbon contained in the venous blood. We have seen that Dr. Edwards is of this number, inasmuch, as he believes, the formation of carbonic acid to take place throughout the body. Dr. Stevens, however, does not regard the air as passively receiving the carbonic acid as it is liberated from the blood, which had not only held it in solution, but actually imbibed it. He considers that it is actively removed by the attraction existing between oxygen and carbonic acid, which overcomes the weaker attraction by which the acid was united with the blood. When the blood has lost its carbonic acid, it presents the bright vermillion tint which naturally belongs to its colouring matter, and salts, when combined. When the venous blood gives up its carbonic acid, it receives in exchange, a portion of the inspired air, which is chiefly at the expence of the oxygen. The proportion of this gas, abstracted from the inspired air, being very nearly, and often exactly, the same as that of the carbonic acid added to it, Dr. Edwards has pointed out the circumstances under which the quantities differ. We must not, however, suppose that it is only carbonic acid which is exhaled, or oxygen which is received by the blood and lungs. The experiments of Allen and Pepys, as well as those of Dr. Edwards, have proved that there is an interchange of other gaseous principles. The reddened and oxygenated blood having returned to the heart, is diffused over the system, imparting animal heat in proportion to the quantity of oxygen which it gives up for the production of carbonic acid. It receives this carbonic acid in exchange for the oxygen which it has lost, and is darkened by its presence, which counteracts the effects of its salts. This, I believe to be a concise sketch of Dr. Stevens's theory of respiration; it is far from clashing with Dr. Edwards's observation respecting the disengagement of carbonic acid; it seems, on the contrary, satisfactorily to account for cutaneous

respiration, since, wherever the atmosphere is exposed to a vascular part, its oxygen must promote the separation of carbonic acid from the venous blood. If we apply this view to the respiration of animals who live in water, and admit that the oxygen dissolved in that fluid, separates carbonic acid from their venous blood, we have another argument in favour of an actual attraction existing between oxygen and carbonic acid, since the discoveries of John Dalton, and the penetrativeness of Dr. Mitchell, are quite inapplicable to the subject.

The experiments of Allen and Pepys to determine the changes produced in the air by respiration, which have been made subsequent to the publication of Dr. Edwards' work, are a continuation of their former researches, and were made solely on the respiration of birds. These enquirers conducted their experiments in the same method as that which they had formerly employed, and in no instance compromised the life or health of the animal. The birds were placed in a small glass chamber, which received its supply of air from one gasometer and parted with it into another at certain intervals. The most careful analysis was made, both of the gas supplied to the animal, and of that which it had respired; every calculation being made which the state of the barometer and thermometer, and the volume of air existing in the receiver containing the bird, and the tubes leading to it, could require; their results may be stated as follow :—

After one hour and twelve minutes respiration, the amount of gasses employed being originally

	oxygen	*azote*	*carb acid.*
Cubic inches ..	245·59	61·41	
There remained	195·61	90·11	21·27

shewing a loss of 28·71 of oxygen beyond the volume converted into carbonic acid, and a gain of 28·70 of azote. The head and other parts of the pigeon in which the state of its vessels could be seen, were of a bright red. In a similar experiment which lasted one hour and ten minutes, 24·74 cubic inches of carbonic acid were produced, besides which, 21·75 of oxygen were lost. In atmospheric air, 35·80 cubic inches of carbonic acid were produced in sixty-nine minutes. In a mixture of oxygen and hydrogen with a portion of azote, a pigeon in the course of twenty-six minutes, produced 17·62 cubic inches of carbonic acid; 35·48 of hydrogen were lost, and 35·23 of azote were added.

Allen and Pepys were not acquainted with the researches of Dr. Edwards, and as they inclined to the belief, that the volume of oxygen lost was replaced by an equal volume of carbonic acid, their delicate and accurate experiments form a valuable confirmation and supplement to those of the Doctor. The experiments of S. D. Broughton, relate to the same subject, but were performed in a somewhat different manner, and supply us with new and valuable facts. He placed a variety of animals in receivers of considerable capacity compared with their bulk; he filled them with different gases, in which he allowed the animals to remain until they were nearly or quite dead, when he examined their state and that of the gas remaining in the receiver. His most important and numerous experiments relate to the respiration of oxygen. He found, as Allen and Pepys had

done, that animals at first bear this kind of respiration with apparent impunity, that the pure oxygen at first acts as a stimulus, and that all the parts of the body in which the state of the vessels can be seen are injected with bright arterial blood. Though this florid colour continues, the powers of the animal progressively sink, he falls into a state of suspended animation, and inevitably dies in the course of a few hours if suffered to remain in the gas; and even if taken out alive, the injury which he has received may be fatal. This effect is not to be ascribed to the deterioration of the air in the receiver, as in the case of an animal dying in a given quantity of atmospheric air. The remaining oxygen is still sufficiently pure to support the vivid combustion of iron-wire, and to produce a repetition of effects on a second and third animal similar to those described as occurring with the first. The animal is found to have all its sanguiferous vessels filled with bright arterial blood, and its temperature is found to have fallen several degrees, even when taken out before life is extinct. The fatal effects of the respiration of pure oxygen gas are confirmed by the experiments of Sir H. Davy, and by those of Drs. Prout and Magendie. The blood is observed quickly to coagulate after the respiration of this gas. S. D. Broughton tried the effects of the gaseous oxide of nitrogen, commonly known as the exhilarating gas; this can be respired longer than other gases, yet death takes place sooner than in pure oxygen. The blood continues fluid and thin. He found animals die very quickly in sulphuretted hydrogen; indeed it is impossible to conceive death more instantaneous than that which I have myself seen take place in a sparrow, which Professor Thenard introduced into this gas. This effect of sulphuretted hydrogen, appears to have been known to the ancients long before chemistry existed as a science, as may be inferred from the expression, *graveolens aornus*, employed by Virgil, as well as from some remarks of Pliny, respecting a fountain not far from Rome. He found carbonic oxide, though a fatal gas, to be less promptly so than sulphuretted hydrogen; and it is worthy of remark, that the interior of animals killed by it, was not only gorged with venous blood, but seemed unusually hot. The results of the preceding experiments, together with some others detailed in this volume, suggest the following observations: —

We have seen that Dr. Holland has objected to the theory maintained by Dr. Edwards, that the amount of animal heat is in proportion to the consumption of oxygen, and endeavours to substitute in its place, that it is in the inverse ratio of the quantity of the blood to the inspired air. It is evident from Dr. Edwards's own words, that by the consumption of oxygen, he means its conversion into carbonic acid, since he admits the absorption of this gas during summer, when even adult animals are considered by him, to lose a part of their power of producing heat.

The researches of Broughton have shewn, that when animals inspire this gas in its pure state, they sink in temperature; and the experiments of Allen and Pepys have shewn, that a larger quantity of this gas is consumed than is replaced by

carbonic acid, the production of which, is diminished. It is also remarked, that those external parts, in which we can observe the state of the circulation, become manifestly injected; hence we must have that condition of the circulation, which Dr. Holland regards as the most favourable for the production of animal heat; yet we have seen that the results alluded to oppose this conclusion. I am inclined to believe, that the production of animal heat bears a close and necessary relation to the quantity of carbonic acid produced. I agree so far with Dr. Holland as to believe, that when the lungs are greatly loaded with blood, the changes in it effected by the air are impeded, and that the temperature may sink; but this I conceive to be the consequence of the diminished production of carbonic acid. On the other hand, the effects of pure oxygen evince a striking difference between animal heat, and that of ordinary combustion. The carbonic acid by which the blood is darkened, is strikingly removed; but contrary to what one would have suspected, *à priori*, its further production is impeded: hence, not only the diminution of temperature, but also, the universal redness of the blood. It has been shewn by some of the experiments of Sir Astley Cooper already related, that immersion in ice-cold water, had the effect of inducing a singularly bright arterial colour in those parts in which the blood is collected. This effect, like that of animals dying in oxygen gas, was more to be ascribed to the suspended carbonization, than to the increased decarbonization of the blood.

Without attempting to draw any express conclusions from the experiments of Dr. Edwards, with reference to temperature, season, and age, beyond those which the Doctor has himself offered, I cannot refrain from remarking, that there is no part of the Doctor's work which possesses greater practical importance and utility. In conjunction with the researches of Dr. Curry of Liverpool, they will afford the most valuable assistance in the regulation of clothing, of exposure to the open air, of confinement within doors, and of the application of the various forms of baths.

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Author Mackintosh, John 68044 M.A.
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